ILLUSTRATED
ELECTRICAL REVIEW
A Journal of Scientific and Electrical Progress.

VOL. 28. No. 24. WEEKLY. | NEW YORK, WEDNESDAY, JUNE 10, 1896. | $3 PER ANNUM. Single Copies, 10 Cents.

Copyright, 1896, by ELECTRICAL REVIEW PUBLISHING COMPANY, Times Building, 41 Park Row, New York.

Entered at Post Office, New York, as Mail Matter of the Second Class.

VIEWS, NEWS AND INTERVIEWS.

Edison received, a few days ago, at his laboratory at Orange, N. J., the hollow eye-pieces of a pair of opera glasses with the request that he "fit them with the X rays" and return them to the Vermont sender. Evidently this Green Mountain individual had a desire to see things.

Another seeker after the unobtainable, writing from Pottstown, Pa., sent the following matter-of-fact epistle:

Thos. A. Edison, Dear Sir: Will you please send me one pound of X rays and bill as soon as possible.

This order was filed away with the opera glasses.

There is a certain superintendent of a large cable railway, who is noted for the rapidity with which he reaches a decision and the promptness with which he acts upon it. In fact, says *Dixie*, he is a continual object lesson to all who know him. Some time ago he was driven almost to distraction by the number of flat wheels that were formed, running to five, six and seven pairs a day. The wheels were from the same foundry where the company's wheels had been purchased for years, and there was nothing in their appearance to indicate anything wrong with them. No change had been made in the brake leverages and the cause of the flat spots was undiscoverable. One day he boarded a car and was watching the gripman. There are two brakes—a lever and spindle brake. The latter has a ratchet handle and a holding ratchet on the floor. He noticed that when the brake was set the gripman would allow the ratchet handle to fly back and then thinking the brake off would set the grip. The cause of the flat spots was at once apparent—the lower dog was holding the brakes set and the cable was dragging the sliding wheels. Our superintendent was riding towards his shops, which were distant about 25 minutes; but in 25 minutes a good many wheels might be slid flat. So he jumped off the car, went into a telephone station and gave instructions to have a force of men go out at once and take off all the floor dogs from the spindle brakes and then resumed his trip. His men never delay in the execution of his orders, and in a little more than an hour all the ratchets were off and no more flat wheels have been reported. It is a good example of quick thinking and prompt obedience.

A filament of somewhat complicated nature, which it is proposed to use for incandescent lamps, has been described in the German technical papers, says a London exchange. The filament is made of hygroscopic asbestos paste. This, after being prepared in the form of a paper .3 millimeters thick, is cut into strips six centimeters wide and impregnated with a 30 per cent solution of platinum chloride, then passed through a saturated solution of sal-ammoniac, after which it is dried in hot air and then heated in a Bunsen flame, which converts the platinum solution into a platinum sponge. It is then further impregnated with a 20 per cent solution of magnesium chloride and heated, which process is repeated until the plate is covered with a uniform coating of magnesia, and it is finally dipped into a 10 per cent solution of cerite nitrate. The magnesium coating protects the platinum, and as the light-radiating properties of the cerite metals are much greater than those of carbon, it is thought possible that such lamps will take less current. It is stated that the electrical resistance is much higher than that of carbon, and the radiating surface can be made much greater.

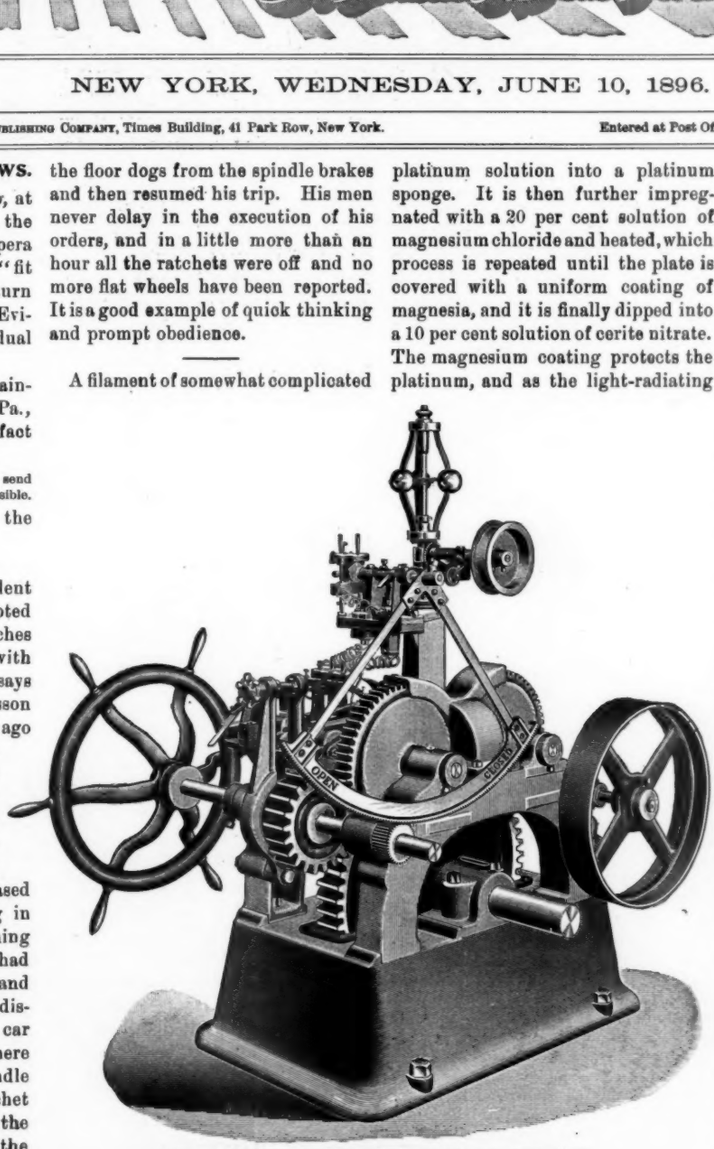


FIG. 1.—REPLOGLE'S RELAY WATER-WHEEL GOVERNOR.

Baron Roentgen has had the honorary citizenship of his native town, Lennep, Rhenish Prussia, conferred on him, in honor of his discovery of the X ray.

An Interesting Test of Water-Wheel Governing.

The Replogle Governor Works, of Akron, Ohio, are the manufacturers of Replogle's relay water-wheel governor, illustrated herewith. The manufacturers have sent to the ELECTRICAL REVIEW the following account of a very severe and interesting test of water-wheel governing:

The government of water power for electric railway work has always been considered a very difficult problem even under the most favorable conditions. Many power-plant operators, where the changes in load are great and sudden, find their government so uncertain and so near the danger line that it has been said that railways can not be run successfully by water power. Again, there are plants in which the changes are but a small percentage of the whole power of plant, or, if the changes in load are great, they may be distributed over such length of time as to allow the power to be readily governed. It is the extreme and sudden changes that cause serious trouble.

In the following test it is intended to show what can be done in the extreme cases, and it was the aim to have the test made under the very worst conditions. The time chosen was during a heavy snow storm, with fully three inches of new snow on the track, and the success in obtaining bad conditions is fully shown by the fact that the circuit breakers went out 10 times during a 30 minutes' test. This, of course, made instantaneous changes of from full load to no load. A most remarkable point shown is that in only one case did the speed rise to slightly exceed five per cent from normal.

The normal voltage was 550 volts, but in no case did the voltage reach 600, and in only one case did it get below 500 volts. These are the extremes and were due only to instantaneous changes of full load, and the variations in speed were only momentary, as will be noticed by consulting the tabulated test, Fig. 2.

The electric railway in question is that of the Citizens' Street Railway Company, Fishkill-on-Hudson, N. Y., connecting with Matteawan and Fishkill villages. The road is operated by the president and general manager, Mr. J. T. Smith, with W. E. Havens, superintendent. There are seven miles of road. The maximum grade in this road is eight and one-half per cent. There are two portions nearly one-half mile long each,

that average about five per cent grade. There are some short curves, and some of them are found on the heavy grades. The main line is giving a ten-minute service, and the suburban line an hourly service. At the time of the test four double-motor cars were in operation, using from 30 to 50 horse-power each. With the permission of Superintendent Havens we will state that one of the cars became short-circuited, which is the direct cause of the extreme variations in the speed during the latter part of the test. This shows, however, more fully the efficiency of the governor under the most adverse conditions.

The power is furnished for this road by the Carroll Electric Company, Matteawan, N. Y., general manager, Chas. H. Wats n, with W. E. Blakely as power house superintendent. The power is furnished from a pair of 48-inch Rodney-Hunt water wheels, under about 15 feet head of water, and is conveyed by belts to a counter-shaft which in turn drives by belt a General Electric M. P. 100 generator. (The plant contains a second generator in reserve, like the one mentioned.)

for the opportunity of making these readings; also by Mark A. Replogle and others, and the new governor can be found at work by any person desiring to see water power governed safely for the extreme conditions that are imposed upon Mr. Watson's power plant.

Referring to the tabulation, Fig. 2, it will be noticed that there are three curves. The top one is the speed curve, the middle one the voltage curve and the bottom one the current curve. It will be noticed that the average, or normal, speed was 105 revolutions on the wheel shaft, and the average voltage was 550. It will also be noticed that the first reading occurred 10 seconds after the first gong, and the numbers that designate the minutes occur at the bottom of the chart, and at the ends of the minutes numbered; that is, the line that is vertical from number 1 shows that there were 80 amperes of current, 540 volts pressure and 103 revolutions on water-wheel shaft at the end of the first minute. At the end of the second minute the chart shows no current, 546 volts and a speed of 104 volts and 105 revolutions, normal speed. This is a remarkable showing. The extreme fluctuations are all recorded accurately and were caused by the short-circuited car and the newly fallen snow. Preliminary readings, under ordinary conditions, showed better regulation than that obtained by Corliss-engine practice.

The above test shows clearly that water-power government has advanced to such a stage that it is safe and reliable, even under the most severe conditions, and it will, therefore, be of great interest to street railway and electric power operators.

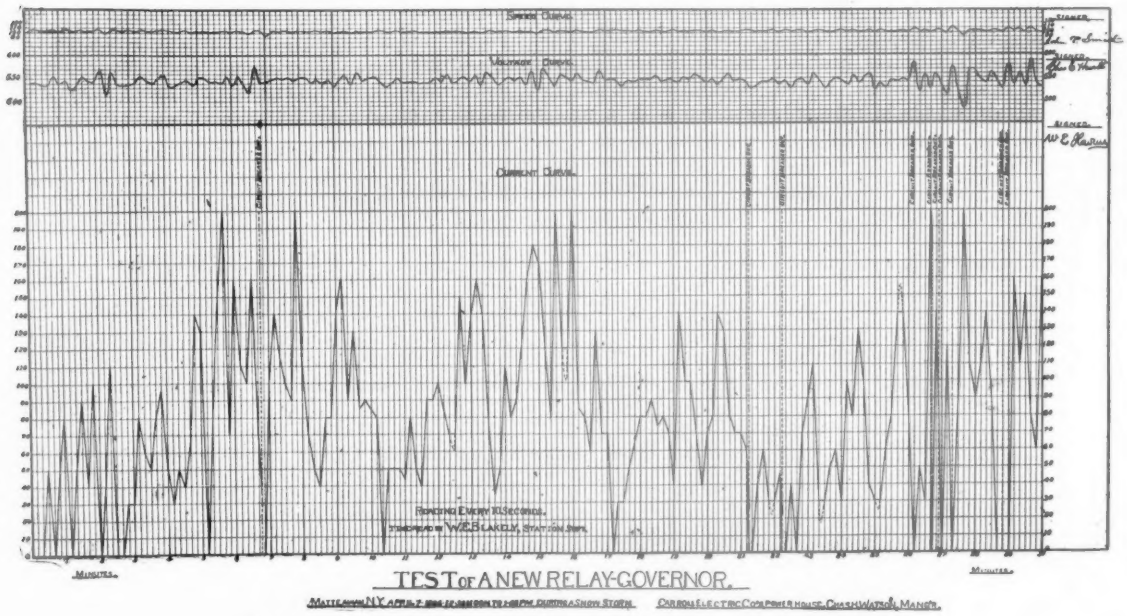


FIG. 2.—TABULATED TEST OF REPLOGLE'S RELAY WATER-WHEEL GOVERNOR.

A preliminary test showed remarkable results when both generators were at work. But it was thought best to make the test under the worst conditions with one generator only, making it more valuable from a scientific point of view.

The wheel can be supplemented with a Fishkill-Corliss engine, which is belted to the same counter-shaft as the water wheel, but during this test the engine was disconnected, leaving all the power to be furnished by the wheel, making this a safe and reliable sample of results that can be secured under such conditions.

Mr. J. T. Smith, president, read the speeds from a Schaeffer & Budenberg tachometer; Mr. C. E. Hewitt, electrician, read the voltage from a Weston voltmeter; Mr. W. E. Havens, superintendent, read the amperes from a General Electric Company ammeter, and Mr. W. E. Blakely, power-house superintendent, noted the time by tapping a gong at the end of every tenth second, and the end of every minute was noted by two taps of the gong. The readings began at 12.38 P. M. and continued for 30 minutes, until 1.08 P. M., when the papers were signed by their respective readers and committed to the hands of Mr. Hewitt, who has favored us with the tabulation of curves that are used in this paper.

The test was witnessed by Mr. Chas. H. Watson, to whom we are indebted revolutions of water-wheel shaft, and 20 seconds later there are 110 amperes used, and the voltage has dropped to 516. The reading 10 seconds later shows no current, 564 volts and 107 revolutions. Over one-half of the load has dropped off in 10 seconds, and yet the speed has gone only two revolutions above normal. This is less than two per cent increase of speed on a 55 per cent decrease of load.

At the end of the first 10 seconds in the sixth minute there is no current, the voltage is 552, and the speed 104, and 30 seconds later there is full load, 200 amperes, 540 volts, and a speed of 102 revolutions. The following reading 10 seconds later is 70 amperes, 556 volts, and 105 revolutions, showing that 65 per cent of the load dropped off in 10 seconds, and yet the speed did not go above normal.

At six minutes and 45 seconds the circuit breaker went out, dropping the whole load instantly, yet five seconds later the reading is no amperes, 540 volts and 107 revolutions. This is equal to the best engine work. The circuit breaker went out during the 22d and 23d minutes with practically no increase in the speed.

At 26 minutes and 40 seconds the readings are 200 amperes, 529 volts, and speed 101. During the following 10 seconds the circuit breaker went out, and at the end of these 10 seconds the readings show 140 amperes, 560

Rose Polytechnic Institute.

The Rose Polytechnic Institute, of Terre Haute, Ind., has issued its fourteenth annual catalogue containing an outline of the courses of study and the plan of instruction. Separate pamphlets are issued describing the courses in electrical, mechanical and civil engineering and chemistry. Any of these pamphlets or the catalogue will be sent free on application.

Steel Wool.

Under the name of steel wool, a substitute for glass, paper has recently been introduced in Germany. It consists of threads of shredded steel of uniform size and having sharp edges. It is claimed to cut more quickly and uniformly than sandpaper, and does not gum or clog, and, being flexible, is well adapted for smoothing up elaborate carvings, etc.

LITERARY.

Under the title of "Why Progress Is By Leaps," George Iles contributes a very interesting article to the *Popular Science Monthly* for June. The main point made by the author is that electricity counts for as much in human progress as the discovery of artificial fire.

The Boston *Post* recently received letters from various street railway magnates, including representatives of systems in Brooklyn, Detroit, Baltimore and Camden, N. J., who favor the free transfer system.

OUR CANADIAN LETTER.

ST. ALPHONSE, QUE.—The Chicoutimi Electric Company will construct an electric railway between that place and St. Alphonse.

LEWISTON, ONT.—The New York Legislature has passed the bill providing for a trolley bridge over the Niagara River at Lewiston.

RICHMOND, ONT.—An electric railway is proposed from Bell's Corners to Richmond, Ont., in the county of Carleton. This would be a branch of the Ottawa & Britannia line.

SHERBROOKE, QUE.—The board of directors of the Sherbrooke, Que., Street Railway Company are J. W. Burke, president; F. J. Griffith, secretary; Walter Blue, William Morris and J. E. Flood.

DUNDAS, ONT.—It is said that the Hamilton & Dundas Railway will be changed to electric traction at once. The line will be changed so as to enable ordinary freight cars to be drawn into Dundas over it.

MONCTON, N. B.—The Moncton, N. B., street railway and the city have completed arrangements for the construction of the road. The tracks are to be kept clear, the roads repaired when injury arises from the company's tracks, and new electric light poles will be erected by the company. The power house will be on the wharf, thus securing cheap coal.

BURLINGTON, ONT.—The Hamilton Radial Railway has been granted right of way by the council of that city on a 32-year franchise and is preparing to begin construction. M. W. Hopkins has been appointed chief engineer of construction. The company will strive to have the line between the city and Burlington Beach completed by Dominion Day. The power house will be located at Burlington, Ont.

CORNWALL, ONT. — Construction work is going forward on the new electric railway at Cornwall, Ont., referred to in last issue. The road will be six and one-half miles long, and the tracks are being laid with "T" rails to accommodate the freight traffic that is to be carried on between the various mills and the Grand Trunk. The rails are to be sunk in the road bed and the company are to keep the road in repair for 18 inches each side of the rails. The Rathburn company, of Deseronto, will supply the cars. A large power house is being built on Water street. The company have purchased the Gillespie Point property east of the town as a park, in which a pavilion, etc., will be erected. Where possible, the track will be laid at the side of the street, to permit the repair of the sewers without disturbing the railway.

J. A. C.

Montreal, June 1.

Trifling With Science.

"What made that X-rays lecturer so mad?"

"Somebody worked him with a piece of boneless codfish."—*Chicago Record.*

THE DRAWBAUGH TELEPHONE CASE.

THE SENATE PATENT COMMITTEE FAVORS AUTHORIZING THE COMMISSIONER OF PATENTS TO ISSUE PATENTS TO DRAWBAUGH.

The Senate Patent Committee on June 2 recommended to the Senate that the Commissioner of Patents be authorized to issue to Daniel Drawbaugh several telephone patents which have been in dispute for a long time. The bill for the relief of Drawbaugh was introduced in the Senate on January 9, 1896. The bill as amended by the Committee and recommended for passage is as follows:

That the Commissioner of Patents is hereby authorized to grant and issue to Daniel Drawbaugh, of Eberlys Mill, Pennsylvania, his heirs or assigns, a patent or patents for the invention of improvements in telephony, shown, described, and claimed in the following pending applications, filed by said Daniel Drawbaugh in the United States Patent Office, namely, application serial number one hundred and twenty-five thousand seven hundred and six, filed on the twenty-seventh day of March, eighteen hundred and eighty-four, and applications serial numbers one hundred and twenty-six thousand five hundred and twenty-seven and one hundred and twenty-six thousand five hundred and twenty-eight, filed on the third day of April, eighteen hundred and eighty-four, said applications being continuations and renewals of a previous application, serial number fourteen thousand and forty, filed by said Drawbaugh on the twenty-sixth day of July, eighteen hundred and eighty; application serial number nineteen thousand five hundred and sixty-seven, filed on the twenty-sixth day of October, eighteen hundred and eighty; applications serial numbers one hundred and twenty-six thousand five hundred and twenty-five and one hundred and twenty-six thousand five hundred and twenty-six, filed on the third day of April, eighteen hundred and eighty-four, as divisions of said prior application, serial number nineteen thousand five hundred and sixty-seven, if said Drawbaugh shall be found to be the original and first inventor of said inventions, notwithstanding that the said inventions may have been in use or on sale more than two years prior to the date of filing of said Drawbaugh's said orignal application of July twenty-sixth, eighteen hundred and eighty; said patents when issued to have the same force and effect from and after their respective dates as though no delay had occurred in presenting the applications therefor; and each of said patents when so issued shall be good and valid in law to secure to Daniel Drawbaugh, his heirs and assigns, the sole right to make, use, and vend the invention described and claimed therein for the term of seventeen years from the date of the Berliner patent in November eighteen hundred and ninety-one: *Provided*, That all persons, firms, or corporations having apparatus containing said inventions, or either of them, in use at the time of issuing any such patent, shall have the right to continue the use of such then existing apparatus without charge or molestation: *And provided further*, That no one shall be liable for any manufacture, use, or sale of said invention or inventions of said Drawbaugh occurring prior to the issuance of such patent or patents therefor: *And provided further*, That the rates to be charged users of said inventions shall be fifteen per centum less than now charged by the American Bell Telephone Company for the use of like inventions, and that the Government of the United States and all Departments thereof, as well as the public schools and municipal fire departments in the several States and Territories, shall have the free right to use said invention or inventions of said Drawbaugh from and after the date of issue of any such patent or patents.

The majority report is signed by Messrs. Wilkinson Call, J. H. Berry, R. Q. Mills and J. C. Pritchard. Their report concludes as follows:

The only objectors to the bill who appeared before the committee were representatives of the American Bell Telephone Company. It appears that the Bell company owns an existing patent, which has yet 12 years to run, that is for the same invention as that for which Drawbaugh seeks a patent. It is known as the Berliner patent. If the scheme of the bill were to grant Drawbaugh a patent by direct legislation we should not recommend its passage, but the effect of its passage will merely be to raise the bar of public use or sale and restore Drawbaugh's status as an applicant for a patent in the Patent Office, still leaving it incumbent upon him to show that he was the first inventor of the subject matter he claims over Berliner, and that he has never abandoned his invention, before he shall be entitled to a patent.

The immediate result of the passage of the bill will be to authorize the Commissioner of Patents to put Drawbaugh's applications in interference with the Berliner patent and give Drawbaugh an opportunity of proving his priority over Berliner. Under existing laws the judgment of the Commissioner of Patents on this question may be reviewed on appeal by the Court of Appeals of the District of Columbia.

In order that the public may not be subjected to any patent for this invention for a longer period than it would be subject to the existing Berliner patent, the bill provides that any patent issued to Drawbaugh, in case he proves his right thereto, shall not extend for a longer period than 10 years.

The public would be undoubtedly benefited if the Berliner patent should be overthrown by Drawbaugh and a patent granted the latter, because a patent for an important invention in telephony would be placed in hands adversary to the Bell company: because the bill requires that the rates charged users of the Daawbaugh inventions shall be 15 per cent less than now charged by the Bell company for the use of like inventions, and finally, because the Government of the United States and all departments thereof, as well as the public schools and municipal fire departments in the several States and Territories, shall have the free right to use the Drawbaugh inventions, a privilege that does not exist under the Berliner patent.

Should government control of the telegraph be assumed within the next 10 years, the right to freely use the Drawbaugh telephone as a part of such a system as the substitute bill permits might become a matter of much public importance.

A minority report was presented by Messrs. O. H. Platt, C. D. Clark and Geo. Peabody Wetmore. Several reasons why they can not concur in the majority report are given below:

The present application to Congress for relief is based upon the allegation that Daniel Drawbaugh, in the year 1867, nearly 30 years ago, invented, either wholly or in part, "the variable resistance telephone transmitter or microphone," which has been for many years used for telephone transmitters. The particular applications in the prosecution of which he seeks relief were filed in the year 1884, but were only continuations and renewals of the previous applications filed in 1880, sixteen years ago.

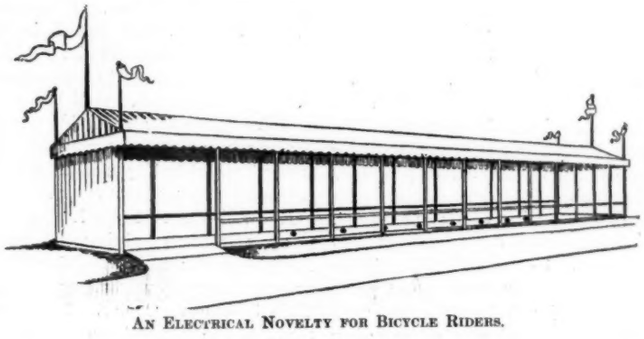
It is claimed by the applicant that the particular structure for which a patent is sought was not invented until 1878. By the telephone cases as reported in volume 126 of the United States Supreme Court Reports, however, it would seem as if Mr. Drawbaugh's claim and the principle covered by these applications was alleged by him to have been invented in the year 1867. However this may be, the invention is, by his own admission, at least 18 years old, and the particular application for the patent now under consideration, if granted, would monopolise the use of telephones throughout the country. The question has been before the Patent Office and the courts since 1880 in the form of applications originally filed and of the applications named in the bill. The tribunals of the Patent Office have unanimously decided that no patent can issue on these applications, because of the fact that more than two years before his original application was filed—that is, more than two years before the 26th day of July, 1880—a microphone transmitter such as he is seeking to patent was in public use and on sale in this country. The Court of Appeals of the District of Columbia has confirmed this ruling of the Patent Office and declared that no patent can lawfully issue on this application because of this public use. The bill proposes to authorize the Commissioner of Patents to grant a patent in spite of this statutory bar.

Before or about the time of filing his application in 1880, Mr. Drawbaugh assigned all of his interests in telephone inventions to a company organized to exploit and promote such alleged inventions, and the real beneficiary of this bill is the People's Telephone Company. Whether Mr. Drawbaugh would personally receive any benefit in case his application, now barred by the statute, could be prosecuted to a successful result, the committee were unable definitely to ascertain. It was intimated that some benefit would accrue to him individually, either through his connection with the company or otherwise, but to what extent, if at all, the committee were unable to ascertain. This corporation has been for years engaged in contesting the rights of the American Bell Telephone Company, and now seeks, through the aid of Congress, to contest with that company its right to the invention covered by what is known as the Berliner patent. A suit is now pending, brought in behalf of the United States by the Attorney-General, for the cancellation of that patent, upon the ground of laches in the prosecution of the application for the same, amounting to constructive fraud. If that suit should be maintained, the microphone transmitter, which is the principal invention giving exclusive privileges to the American Bell Telephone Company, would be free to the public, unless, through the aid of Congress, a patent should be obtained by the Drawbaugh corporation for the same invention, in which case it would undoubtedly acquire a monopoly of the invention for the same length of time which the Berliner patent has now to run.

The undesigned can conceive of no reason why, in case the American Bell Telephone Company's Berliner patent should be adjudged void, Congress should aid any corporation to impose the same patent upon the public, especially as the laches of the alleged inventor seems equally apparent with that charged against Berliner.

An Electrical Novelty for Bicycle Riders.

A patent is now pending on a device for the amusement of bicycle riders that will, beyond a doubt, meet with a hearty reception. The accompanying illustration shows one recently erected on the Coney Island cycle path.



AN ELECTRICAL NOVELTY FOR BICYCLE RIDERS.

This platform is 100 feet long by 10 feet wide. On its surface is set a series of push-buttons, which are connected through a battery to an electric bell and an annunciator.

The rider starts at one end and endeavors to guide his wheel over and depress as many of the buttons as possible in a trip down the platform. When a button is struck the bell rings and the annunciator registers the particular button. Both register and buttons are correspondingly struck, thus enabling a score to be kept if desired. It is the intention of those interested to sell these paltforms outright and give territorial protection to purchasers during the life of the patent. They expect that owners of seaside and country pleasure resorts will recognize a drawing card in this novel device.

A New X-Ray Company.

The X-Ray Manufacturing and Exhibiting Company, of New York, has been organized with a capital stock of $10,000. The directors are Cyrus O. Baker, Jr., John A. Seely, E. F. Peck, P. J. Bennett, Fremont Wilson. The company will exhibit the X-ray apparatus and its work to the public of New York and vicinity, several locations having already been secured on Broadway.

PERSONAL.

Mr. C. S. Bradley, the well known electrical inventor, sailed for Europe last Saturday. He will spend considerable time in Switzerland.

Mr. U. N. Bethell, general manager of the Metropolitan Telephone and Telegraph Company, of New York city, is spending a two months' vacation in Europe.

Mr. Wm. H. McKinlock, of Chicago, came to New York last week to meet his family who arrived from an extended stay in Europe on Wednesday. They returned to the great western city on Saturday.

Horace B. Gale, a well known electrical engineer of Boston, has accepted a responsible position with the American Electric Heating Corporation, of that city, and will hereafter be a prominent member of the staff of General Manager Ayer.

Mr. T. C. Martin, editor of the *Electrical Engineer*, sailed for Glasgow on the "City of Rome" last Saturday. Mr. Martin goes to the jubilee celebration of Lord Kelvin, on June 16, as the representative of American electrical societies. He was accompanied by his wife and son.

Hon. J. G. Slonecker, of Topeka, Kas., a gentleman who has many friends in electrical circles, is a candidate for judge of the Court of Appeals in his State. The ELECTRICAL REVIEW does not often enter into politics, but in this case is pleased to make an exception and most heartily indorses Mr. Slonecker for this official position, for which his abilities and his integrity so admirably fit him. The State of Kansas will be honoring herself by placing him on the bench, and his many friends in the East, where he is widely known as a lawyer of eminent attainments, will rejoice over his election.

Niagara Falls Hydraulic Power and Manufacturing Company.

The New York *Herald* last Saturday published a dispatch from Niagara Falls, N. Y., to the effect that the plant and water privileges of the Niagara Falls Hydraulic Power and Manufacturing Company had been sold to the firm of Morton, Bliss & Company, bankers, of New York, for $4,000,000. Governor Morton is a member of this firm.

Mr. George T. Bliss, of Morton, Bliss & Company, said there was no foundation for the story and that no negotiations looking to such a purchase were pending or contemplated.

Westinghouse Company's Capital Increased.

The stockholders of the Westinghouse Electric and Manufacturing Company, at a special meeting held on June 5, formally voted to increase the capital stock of the company from $10,000,000 to $15,000,000.

The work on the plant of the Western Telegraph and Telephone Company, of Fort Wayne, Ind., is progressing rapidly. The underground conduit system is about completed and the work of drawing in cables will be begun this week.

ELECTRICAL FEATURES OF THE NEW NATIONAL LIBRARY AT WASHINGTON, D. C.

BY GEORGE H. DRAPER.

The new National Library at Washington, D.C.—that magnificent building now in course of completion, and which will, when finished, cost $6,500,000—has always been only partially opened to the public, but the writer recently had an opportunity to visit some portions of it not accessible to every one. The beauties of its architecture, elegance of its interior structure, frescoing, etc., have been adequately described in some of the larger daily journals, and it may be of some interest to our readers to learn something of its electrical installation, together with some observations on the boiler plant and other apparatus of that character in the building.

It will be well to mention here that the entire construction, both exterior and interior, in every detail, has been under the direct supervision of the late Brig.-Gen. Thomas Lincoln Casey, U. S. A., and, since his decease, under Mr. Bernard R. Green, who has been selected by Congress to fill the vacancy.

The Library Building proper covers nearly four acres of ground, is three stories high with a large dome in the center. There are many rooms and book alcoves, an immense rotunda and large halls to be lighted, and it is estimated that it will take 6,000 incandescent lamps of 16 candle-power to give the proper illumination.

The chandelier and side-bracket arrangement is followed in lighting the rooms and alcoves, and in each alcove are also one or two pendant lamps for the purpose of easily finding books. In the corridors and rotunda, or reading room, however, the lighting is somewhat more elaborate, the corridors being fitted out with shapely ground-glass balls, while the rotunda is lighted almost entirely by diffused light. Except in the places where brackets are used, incandescent lamps are placed on top of the large pilasters and on cornices, and the light is reflected from the gold and white ceiling into the body of the hall below. Incandescent lamps will be used throughout.

While the electric plant is practically finished, it is not entirely finished, but there is enough in view to give one a superficial idea of the whole. Bids on the electric plant were given in separate, as was done in all other work, and the engines, dynamos, appliances and other material were furnished by the lowest bidders whose apparatus came within specifications. Good material has been secured and intelligent engineering skill is much in evidence.

In the northeast basement of the building a large space has been set aside for the engine and dynamo room. It is 90 feet long by 18 feet wide and 10 feet high; it is excellently ventilated, and, with its complement of necessary conveniences, will be a very fine room of its character.

The boiler house is an underground structure of brick and dressed granite, 125 feet long by 35 feet wide and 25 feet high. It has a heavy glass roof raised about four feet above the ground surface, and is located about 75 feet east of the center of the Library Building proper. It has in connection with it a large stack, 90 feet in height by 12 feet square at its base, which is also made of dressed granite.

The engine and dynamo room is splendidly equipped with a model electric plant. This plant is composed of four generating sets, three of which are the well known simple automatic horizontal Ball engines of 150 horse-power each, direct connected to three 125-volt, 100-kilowatt direct-current Siemens & Halske dynamos, and one 35 horse-power simple automatic horizontal Ball engine, direct connected to a 125-volt, 25-kilowatt direct-current General Electric generator of the six-pole ironclad armature type. This unit is 25 kilowatts, the other three sets being 100 kilowatts each. The large sets run at 230 revolutions per minute and have a 16-inch cylinder and 16-inch stroke. The small set runs at 300 revolutions per minute and has a cylinder of 8½ inches with a 10-inch stroke. The generating sets are located side by side, the dynamos being nearest the lighted side of the room and about 15 feet apart. The small set, which will be used most for the day load, comes first as you enter the room.

At the farther end of the room, and occupying a very prominent position, will be located a handsome switchboard. It is to be of white marble, and will be one of the most attractive features of the plant when completed. It comprises one generator panel, 15 circuit panels and one panel for power connections. Each machine has an ammeter and voltmeter, and one 4,000-ampere ammeter measures the total output of the plant.

The booster system of regulation is to be used, and the apparatus for this purpose is located in the rear of the switchboard. All the instruments used for test and measuring have been supplied by the Weston Electric Instrument Company, of Newark, N. J.

The entire building is wired on the two-wire system, and, as stated previously, the building is wired for 6,000 incandescent lamps of 16 candle-power each, and at full load a drop of three volts is expected. Simplex wire has been used throughout, and the Simplex Electrical Company has already furnished about 25 miles of wire, all told. This wire has all been placed in iron-armored conduits, furnished by the Interior Conduit and Insulation Company, and, except that in the celler of the building, is all concealed work. There are 16 single-throw double-pole circuit switches, and 16 sets of feeders, with an entire cross-section of 6,300,000 circular mils, running to the several centers of distribution on the first floor, and from there to the distribution boxes about the building. Moulding and insulators have been used very sparingly and only in those instances where it could not well be avoided. The mains and feeders are so arranged as to be used on one or all the machines at any time, and the lights throughout the building are under the control of the Chief Electrician.

On the east side of the boiler house, and running its entire length, are located two batteries, each composed of four pairs of Bashaw & Stebbin's ordinary tubular-shell boilers of 60 horse-power each, making a total of 960 horse-power, and they are so arranged as to be used singly or all or any number of them at any time, and any one boiler can be removed for repairs, etc., without interfering with the others. They have a compact and neat appearance, and are finished in brass.

There is a space of about 16 feet between the boiler fronts to the other side of the room, at which point are located the fireman and engineer's office, bath and wash room, and toilet room. At the farther end are store rooms and an ash lift. At the south end of the boiler room, and on the upper ground surface, is a coal weigher's office, and diametrically opposite, in a room similarly constructed for symmetry in appearance is housed the ash lift. Coal is delivered to the boiler room by wheel barrows from a store room, which in turn is replenished by means of surface manholes in the driveway.

Electricity is used in the Library for power as well as lighting. A large tunnel has been constructed from the present Congressional Library, in the United States Capitol Building, through the Capitol and Library grounds to a point directly under the center of the Library Building. This tunnel has a system of cable cars, which are operated by a five-horse-power electric motor for the purpose of transporting books back and forth to Congress.

There are nine elevators in the building, used for freight, passengers and books, the power for which is hydraulic.

Steam is generated at a pressure of 80 pounds, and, after going through a perfect system of steam piping, passes through a Hine's separator and enters the engines. It is afterwards exhausted through a feed-water heater, and the waste product is used in heating the building.

There is nearly 75 miles of steam, water and gas piping in the building, 20 miles of which is used in connection with the electrical wiring. Although electricity is used for illumination, in the construction of large government buildings, it is always thought best to install a few gas pipes, as has been done in this instance.

As near as can be ascertained, the following is a list of the kinds of apparatus and materials used: Weston instruments, Ball engines, Siemans & Halske and General Electric generators, Stokes & Parish elevators, Bartlett & Hayward Company, heating coils; Bashaw & Stebbin's boilers and tanks, Davidson & Company feed pumps, and the smaller electric material being furnished by many companies. Jenkin's valves are used on the steam piping, Crane's valves on the hot-water and Chapman's valves on the cold-water piping.

As stated in the first part of this article, the entire construction has been under the direction of the late Brig.-Gen. Thomas Lincoln Casey, U. S. A., and Mr. Bernard R. Green, who have a corps of expert assistants. The work is nearly completed and there is no doubt that the electrical end of it will be in keeping with what will be the handsomest building of its kind in the United States.

Westinghouse-General Electric Patent Committee.

A press dispatch from Pittsburgh, dated June 2, states that the Board of Control of the Westinghouse-General Electric combination has just completed the work of settling all the patent suits which the two great electrical concerns had lodged against each other. The suits number more than 300, and it is estimated the two companies will save by the move more than $3,000,000 in counsel fees alone, besides millions of dollars that might have been obtained in damages. This ends all litigation between the two companies, and promises a new lease of life for both corporations.

While the two big companies were fighting, the little electric concerns were quietly building up their businesses, and were getting into shape to compete with the larger corporations.

Walter D. Updegraff, private secretary to George Westinghouse, Jr., said the settlement of the suits was of untold value to the two companies, and that an unlimited amount of money would be saved. He said the past litigation had been alarmingly expensive, but under the new arrangement the Board of Control, consisting of Charles A. Coffin, president of the General Electric Company; F. P. Fish, its general counsel; George Westinghouse, Jr.; Paul D. Cravath, of New York, counsel for the Westinghouse company, and E. B. Thomas, of New York, would enter suits and prosecute for both companies.

An article of great contemporary interest in *Scribner's* for June is Henry Norman's vivid picture of the present condition of affairs in the most crucial point in all European politics — the Balkan Peninsula, where a half-dozen little principalities are the buffer between the great powers of Europe. A few months ago Mr. Norman made a visit to this region, and this article is the first presentation of the impression then gathered of Roumania, Servia, Bosnia, Herzegovina, Bulgaria and Montenegro.

At the last Spring election, held in April, Defiance, Ohio, voted to erect and maintain its own arc lighting plant and to be connected with an incandescent service, provided the scheme could be carried out within $30,000, the amount voted.

The Electric Light That Failed.

[*From the New York Sun.*]

Weehawken street is one of the very smallest thoroughfares in this city. In fact, it is little more than an alley, being only a block long, and a very scant block at that. It runs from Christopher street to West Tenth street, just back of West street, and the population is humble in station. But, little as it is, Weehawken street knows its rights, and will have them at all costs, a fact which the electric light company found out by experimenting with some 25 men for the better part of a day.

The trouble was that the company tried to put up an electric light pole in Weehawken street and Weehawken street didn't want any electric light. What was the good of an electric light, it asked. For more years than have elapsed since electric lights were invented, Weehawken street had got along first rate without any lights other than those at the end of the street. It didn't want light. If a man came home so drunk that he couldn't see without a sputtering electric light to show him his own doorstep, he didn't deserve to get home at all. Let him sleep in the gutter and be thankful that there was a good, quiet gutter there for him to sleep in. Besides, nobody had consulted the residents of the thoroughfare as to putting in a pole. Should an alien company come in, plant poles, and raise a crop of illuminations under their very noses—or over them—without running up against an obstacle? Not on your life, said Weehawken street.

So it happened that when a foreman in charge of a dozen men entered those peaceful precincts one day last week and proceeded to superintend the work of digging a hole on the east side of the street, he encountered an interruption. As he afterward remarked, he didn't know who the lady was, but she looked as if she wouldn't dodge any trouble that might come her way when she poked a red and aggressive head out of a second-story window and inquired:

"What ar-r-r yez doon they-ar?"

"Going to put up an electric light pole," said the foreman.

"Did my mon Tim say yez cud be diggin' exkyvations forninst his front dure?"

"It's all right. We won't bother you any; just going to set a pole in here for a light."

The head disappeared. But presently came back again, and a hand was thrust out holding a flatiron.

"I hov a flatiron here," said the owner of the hand, "an' t'ree more on the windysill, an' four stove lids whin them t'ree is gahn, an' my man Tim will be comin' home purty quick, not countin' six other fellies livin' here, an' I t'ink there'll be somethin' gettin' broke. I'm goin' t' drop this whin I count t'ree. Wan—two—"

"Hold on, there," shouted the foreman, as his workmen scattered; "Don't drop that thing. You'll kill somebody. You don't understand this thing. It's all right. The city ——."

"I ain't much on argymint, but I'll nail the first mon that puts a hond to a shpade to dig that exkyvation."

Pleading and argument were alike vain, so the foreman presently withdrew his men and went away. On Sunday, however, the attack was renewed, the foreman thinking perhaps that the guardians of the street's rights would be away enjoying the holiday. This time the attempt was made on the west side of the street

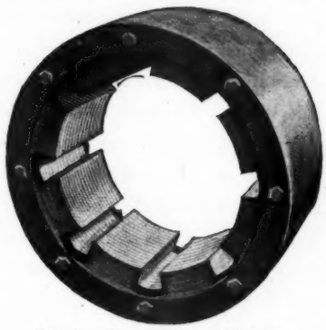


FIG. 1.—ARMATURE OF WARREN ALTERNATOR.

just behind the rear entrance to the saloon of John Tietjen. The foreman had with him a force of two dozen men and a long truck with lowering apparatus, bearing the pole. This ponderous equipage came rolling into Weehawken street and roused the whole place, including Mr. Tietjen. He went out and told the workmen, who were about to begin digging a hole, that he wouldn't allow it. They laughed at him.

"All right," said he. "We'll see if there's any law in this city."

Up to the station house he hurried and reported the matter to the Sergeant.

"It isn't a matter for the police," said the Sergeant. "As long as there is no breach of the peace we can't interfere."

"Well, could you if there was a breach of the peace?" asked Tietjen.

"Certainly; that's what the police are for."

"Much obliged," said the saloon keeper as he hustled away. "You'd better have the reserve squad on tap."

All along West street on any bright Sunday afternoon you can find little encampments of lounging 'longshoremen basking in the sun. It is their method of spending a holiday. Tietjen ran down West street until he came to a group lying flat on their backs on a pier.

"Say, boys, do you want a drink?" he asked.

The 12 good men and true who formed the group sat up and looked at him reproachfully. What was the use of taking up time with fool questions? their look plainly asked.

"You get all the drinks you can swallow, free," continued Tietjen, and then he stopped, for the 'longshoremen had all fallen back into their original positions, and on their faces were imprinted disgust and contempt. They weren't to be taken in by any such sawdust game as that.

"This is on the level," insisted Tietjen, interrupting their dumb show: "Come along to Mulqueen's and I'll give you a starter." Considering it worth the experiment anyway, the 12 rose and followed to Mulqueen's Raines-Bill Hotel, where they had their drink. Then said Tietjen to Mr. Mulqueen:

"Give these men all they want to drink and anybody else that comes in with them, and put it on me."

After this he explained his plan to the 'longshoremen and they went out and got many more 'longshoremen until about 35 were collected. These went to Weehawken street with their backs strangely square and wooden handles sticking out from the rear of their coats. Meantime the foreman's gang had been digging busily, and the hole was almost done. Quietly the 'longshoremen watched the finishing touches put to it.

"Ready now with that pole," ordered the foreman. "You've dug deep enough."

At the word there was a sudden, mysterious appearance of spades and shovels in the hands of the 'longshoremen, who pitched in with such a will that almost before the pole planters knew what was happening the hole was not only filled up, but was made the basis for a neat mound of earth some two feet high. Having done their work, the 'longshore contingent repaired to Mulqueen's Hotel to celebrate themselves, and Mr. Tietjen retired into his saloon. But the electric light people were not beaten yet. When Mr. Tietjen wandered out into Weehawken street half an hour later he was horrified to find the hole almost completed again. Down he rushed to Mulqueen's and back again, just in time to hear the order:

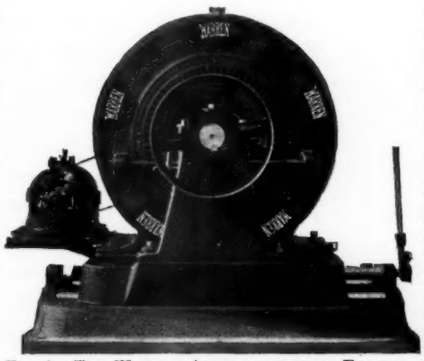


FIG. 2.—THE WARREN ALTERNATOR WITH EXCITER.

"Lower that pole now."

It was time for action. Without an instant's hesitation Mr. Tietjen jumped into the hole. By this time the 'longshoremen were arriving on the scene and the entire populace of Weehawken street was out. The pole was slowly approaching Mr. Tietjen's head.

"You'd better get out of there," warned the foreman. "If that pole should slip you'd be dead and buried in two seconds."

The saloon-keeper made no answer, but he got first red and then white as the massive piece of wood approached him. Angry mutterings began to come from the 'longshoremen and the Weehawken streeters, and they began to press forward.

"If that pole touches him," said a voice, "there'll not one of you get out of this street alive."

Still the pole descended. It was very close now. A big 'longshoreman stood on either side of the hole, grasping Tietjen by the hands, with what purpose it was difficult to judge, as they couldn't have pulled him out with the pole over him. At this juncture a window across the street was raised, a red head was thrust out, and a shrill voice cried:

"Ar-r-r yez men or ar-r-r yez mice? Run them invaders aff the eart'. Kill that moonkey man av a boss. Bedad, I'll do it mesilf. Yez blaygard, lift oop that pole or I'll be down they-ar wid my flatiron!"

That settled it. The foreman gave up. At his order the pole was raised back on the cart, and the force of planters retired with their truck amid cheers. Tietjen's 'longshoremen filled up the hole again and then went to Mulqueen's and filled up themselves.

Weehawken street isn't lighted yet.

The Warren Alternator.

So accustomed is the average visitor to central lighting stations to seeing a rapidly whirling armature that a dynamo having an armature that stands still is somewhat of a novelty. A dynamo so designed possesses other than merely novel features, which fact has been demonstrated by the Warren alternator.

The illustration herewith shows the armature of this new type of alternating apparatus. As will be observed, this part is a ring fitted into and secured to the dynamo frame. It is composed of thin sheet-steel, assembled, as shown, between two heavy cast-steel rings, the inner and outer circles turned true, the outer to fit accurately into the perfectly bored steel frame, the inner to form a perfect circle in which the toothed end of the rotor revolves.

The rotor is a cylinder of cast-steel, into which the shaft is fitted and forced, and upon the surface of one end projections are built up of thin sheet-steel. The other end is turned smooth and true, and fits into the smooth bore of the pulley end of the circular steel frame with a clearance of scarcely a sixty-fourth of an inch. At this point the rotor revolves in perfect equilibrium in a most intense magnetic field, but has no rise and fall, it being always maximum. Through the teeth or projections the magnetic flux is carried outwardly and delivered to the opposite element, the stationary armature. At this point the rise and fall occur, from zero to maximum and the reverse, hence the necessity for the use of thin metal construction. Upon first thought this rotor might be called the armature. It is instead the revolving field core. It carries no wire, nor is there an inch of wire in motion upon this machine, consequently no commutator, collector rings or brushes are required. Fig. 2 is a view of a complete dynamo with exciter. This apparatus is made by the Warren Electric Company, of Chicago.

ELECTRICAL REVIEW

Times Building, 41 Park Row,
P. O. Box 2339. NEW YORK.

EDITOR:
CHARLES W. PRICE.
ASSOCIATE EDITOR:
STEPHEN L. COLES.

REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.

1546 "CORTLANDT," TELEPHONE CALL.

SUBSCRIPTION TO THE
ELECTRICAL REVIEW.

One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - - 5.00
Single Copy, - - - - - - - - .10
Back Copies, each, - - - - - - .25

SPECIAL NOTICE TO ADVERTISERS.

***CHANGES** for advertisements must be in this office by Friday noon for the following week's issue. NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.*

NEW YORK, JUNE 10, 1896.

CONTENTS.

	PAGE
Views, News and Interviews.	297
An Interesting Test of Water-Wheel Governing.	297
Rose Polytechnic Institute	298
Steel Work	298
Literary	298
Our Canadian Letter	298
Trifling With Science	298
The Drawbaugh Telephone Case	299
An Electrical Novelty for Bicycle Riders	299
A New X-Ray Company	299
Personal	299
Niagara Falls Hydraulic Power and Manufacturing Company	299
Westinghouse Company's Capital Increased	299
Electrical Features of the New National Library at Washington, D. C.	300
Westinghouse-General Electric Patent Committee	300
The Electric Light That Failed	301
The Warren Alternator	301
Effects of the St. Louis Storm	302
Criminal Overcrowding of Trolley Cars	302
The Drawbaugh Telephone Patents	302
Effects of the St. Louis Storm	303
The Financial Side	303
Steam Boilers: Their Equipment and Management	304
Paper Lamp Shades	305
A Punching Press for Instrument Work	305
Telephone News and Comment	306
The Nowotny Arc Lamp	306
An Exhibition of Modern Photography at the Electrical Exposition	306
Advance Information	307
Kindred Interests	ix
Electrical Patents	x
"Eclipse" Electric Bicycle Lamp	x

INDEX OF ADVERTISERS.

COVER PAGES.

	PAGE
Abendroth & Root Mfg. Co., boilers	xvi
American Electrical Works, insulated wire	i
Armington & Sims, engines	xvi
Beacon Lamp Co., incandescent lamps	i
Biddle, J. G	i
Bishop Gutta-Percha Co., wires and cables	xvi
Bristol Co., recording voltmeters, etc	i
Bunnell & Co., J. H., dry batteries	i
C. & C. Electric Co	ii
Day's Kerite, insulated wire	i, viii
Diehl Mfg. Co., fans	xv
Electric Appliance Co., supplies	i
Faraday Carbon Co., carbons	i
Goubert Manufacturing Co., heaters	xvi
Greeley, The E. S., & Co., electrical supplies	i
Hampson, E. P., & Co., engines	xvi
Interior Conduit and Insulation Co., Lundell dynamos and motors	i
Lombard Water Wheel Governor Co	xvi
McKenney & Waterbury, lamps and fixtures	i
Moore, Alfred F., insulated electric wire	i
Okonite Co., insulated wire	i, xvi
Partridge Carbon Co., motor and generator brushes	i
Roebling's, John A., Sons Co., lead-encased cables	xvi
Safety Insulated Wire and Cable Co	i
Standard Paint Co., insulating compound	i
Stirling Co., water tube boilers	xvi

INSIDE PAGES.

	PAGE
Addystone Pipe and Steel Co	iv
American Bell Telephone Co	xiii
American Electric Telephone Co., long-distance telephones	xiii
American Engine Co., American-Ball engines	iv
Baker & Co., platinum	viii
Ball & Wood Co., engines	v
Baxter, H. E., & Co., electrical supplies	ix
Bi-Metallic Electric Transmission Co., bi-metallic wire	ix
Brady, T. H., Brady mast-arms	ix
Brill, J. G., Co., railway cars	viii
Brixey, W. R., Day's kerite wires and cables	viii
Brush Electric Co., electric lighting and power apparatus	vii
Central Electric Co., fans	iii
Coles, W. S	x
Connecticut Pipe Mfg. Co	ix
Consolidated Telegraph and News Co	v
Correspondence School of Technology	ix
Cutter Electric and Mfg. Co	ix
Dayton Globe Iron Works Co., new American Turbine	xi
Dickinson Electric Supply Co., sign lamps	iv
Dixon, Jos., Crucible Co., belt dressing	iv
Duval, E. S., Jr., patents	x
Dyer & Driscoll, patent solicitors	x
Empire China Works, porcelain specialties	iv
Eppenger & Russell Co., Valentine subway electrical conduit	iv
Farr Telephone Construction & Supply Co	xiii
Fleming, W. H., woven wire dynamo brushes	iv
Fort Wayne Electric Corporation, "Wood" apparatus	iv
Garvin Machine Co	vii
Harrisburg Foundry & Machine Co., Harrisburg ideal engines	v
Hooven, Owens & Rentschler Co., electric railway and electric light engines	iii
Huebel & Manger, bells, push buttons, etc	ix
India Rubber and Gutta Percha Insulating Co	vii
International Correspondence Schools	ix
Jewell Belting Co	iii
Keystone Telephone Co	xiii
Lehigh Valley Creosoting Co., creosoted lumber	iv
Manhattan Electric Supply Co	xii
Marshall, Wm., condensers	ix
Mason-Maxwell Telephone Mfg. Co	xiii
McCreary, A. A	iii
McIntire, C., Co., The, connectors and terminals	ix
Metropolitan Electric Co	v
Mianus Electric Co., telephones and electric supplies	xiii
Morrison Southern Electric Co	xiv
Morris, Tasker & Co., poles, tubes, etc	xii
Mutual Life Insurance Co	xiv
National Pipe Bending Co., heaters	v
New England Electric Supply Co., electrical supplies	iv
New England Engineering Co	xi
New York Belting and Packing Co., rubber belts	vi
New York Electric Co., incandescent lamps	viii
New York Insulated Wire Co	iii
Novelty Electric Co., supplies	vii
Ostrander, W. R., & Co., supplies	iv
Partrick & Carter Co., electrical supplies for housework	ix
Pemsel, F., machines, etc	ix
Phillips Insulated Wire Co., wire	ix
Receiver's Sale	x
Replogle Governor Works	xii
Rodrigues, M. R	iv
Royce & Marean, electrical supplies	xi
Rose Polytechnic Institute	ix
Safety Car Heating and Lighting Co	vi
Schoonmaker, A. O., India mica	ix
Solar Carbon and Mfg. Co., carbon specialties	ix
Standard Underground Cable Co	xii
Stanley Electric Mfg. Co., S. K. C. two-phase system	vi
Telephone Construction Co	xiii
The "American"	iv
U. S. Mineral Wool Co., copper caskets	viii
Viaduct Mfg. Co., telephones, etc	ix, xiii
Warren, A. K., & Co	v
Washington Patent Agency	x
Western Electric Co., fans	xiv
Westinghouse Electric & Mfg. Co	iii
Weston Electrical Instrument Co., measuring instruments	viii
White-Crosby Co., contracting engineers	ix
Whitney Electrical Instrument Co	ix

S. F. Van Choate, a Boston "expert," thus concludes a diatribe in the Boston *Traveler:*

My pen and club are ready to give a whack at any electrical humbug or serpent of fraud that may raise up its head to delude and deceive the public, or that may be lauded in the Boston *Herald.*

If Van Choate's club is a boomerang it may do some real good, provided he hurls it hard enough.

EFFECTS OF THE ST. LOUIS STORM.

In this issue of the ELECTRICAL REVIEW we publish a complete and accurate account of the heavy losses sustained by the electrical companies of St. Louis as a result of the terrible storm which swept over that city on May 27. The only company whose wires were underground in the city was the Postal Telegraph-Cable Company, and it was over their lines that prompt news of the storm and its devastating effects was sent to the outside world. All other wires in the city were strung overhead, and, wherever the course of the storm was, there also was complete destruction. While such terrible storms are very infrequent, yet we have here the most forcible example possible of the advantages of underground wire and cable systems.

The loss to the electrical companies will be $500,000, and it will be a serious blow to many of them. We extend our sympathy to the electrical fraternity of St. Louis, and hope that the damage will be only temporary.

CRIMINAL OVERCROWDING OF TROLLEY CARS.

The ELECTRICAL REVIEW mentioned last week that the Seventh avenue line of the Nassau Electric Railroad Company in Brooklyn was, probably, the worst managed street railway line in the country. We have received more complaints from passengers and note more criticisms from the press of that city than emanate from any other source. On Sunday last there were three accidents on the Nassau line. In one case a trolley car, running backward down a hill for one-third of a mile, killed one boy, fatally injured one woman, seriously injured six other passengers, and slightly injured nearly two dozen others. The car was said to have carried, at the time, 133 passengers. This awful overloading was the result of the greed of the management in securing Coney Island business. The methods of this company should be stopped by the proper authorities promptly and effectually.

Another monthly has entered the electrical field with the title of *American Electrician.* Mr. W. D. Weaver is the editor, and he devotes about three columns of the first issue to a "Salutatory." We trust all the promises will be fulfilled and that prosperity will be the editor's portion.

THE DRAWBAUGH TELEPHONE PATENTS.

During the past week telephonic circles have been greatly agitated by a report from Washington that the Senate Committee on Patents had reported favorably on a bill authorizing the Commissioner of Patents to issue patents to Daniel Drawbaugh on his various alleged inventions, applications for which have heretofore been defeated in the Patent Office and in every court before which they have been brought. The fact that Senator Platt, of Connecticut, one of the best authorities on patent law in the country, is chairman of the committee, was made much of by the Drawbaugh champions. The ELECTRICAL REVIEW has taken special pains to get at the truth of the matter.

The Drawbaugh bill, as originally introduced in the Senate and referred to the committee, ordered that patents should be issued to Drawbaugh for nearly all he ever claimed. This bill was amended by the substitution of another bill, which proposes to restore Drawbaugh to his standing in the Patent Office, notwithstanding the bar of two years' public use, and gives him another chance of getting a patent.

Senator Platt, instead of favoring this bill, is decidedly opposed to it, and joined with Senators Clark and Wetmore in preparing a very intelligent and able report against the scheme.

The favorable report is signed by Senators Call, Berry, Mills and Pritchard. It is a significant fact that all the friends of the bill are administration men, while the opponents are Republicans.

It is believed by some that the old Pan-Electric hostility to the American Bell Telephone Company is still alive, and that its influence has been felt in this case, although there is no reason to suppose that the People's Telephone Company, which owns the Drawbaugh inventions, has any senatorial stockholders on its list. Drawbaugh, himself, is practically out of the case and has no interest in the matter.

The introduction of this bill is a renewal of the attack on the Bell Telephone Company, and it is also an attack on telephonic patrons. The success of the scheme would be, it is safe to predict, the death of most of the companies working in opposition to the American Bell. There is, however, no probability that the bill will ever become a law. It will serve a temporary speculative purpose and pass into history.

The bill and report are published on another page in this issue.

EFFECTS OF THE ST. LOUIS STORM.

THE ELECTRICAL COMPANIES OF THE CITY LOSE ALL THEIR OVERHEAD LINES IN THE PATH OF THE TORNADO—TEN SQUARE MILES OF DEVASTATION — MONEY LOSS AMOUNTS TO HALF A MILLION DOLLARS—THE DAMAGE IS BEING RAPIDLY REPAIRED.

The storm that swept over St. Louis one week ago to-day left destruction in its path. The greatest sufferers from a material standpoint were the wire-using companies of the city. The only wires under ground are those of the Postal Telegraph Company. All others are, or were until the storm last week, strung on poles. The overhead network included telegraph, telephone, electric light, power, messenger and trolley wires. The path of the storm extended from the Poorhouse, in the southwestern part of the city, nearly six miles from the Court House, in a direction a little North of East to the Mississippi River, the center of the storm striking the river at a point about five miles from the Poorhouse. From this point the storm veered to the northeast, crossed the river and swept over East St. Louis. The path on this side of the river varied in width from a few hundred yards along the river to nearly three miles half way between it and the Poorhouse. The entire area covered by the storm—the portion of it of sufficient force to blow down wires and poles—was fully 10 square miles. East St. Louis is not included in this estimate. The western half of the territory is thinly settled and includes two large parks and comparatively few lines of wire. The eastern half is thickly settled and the streets in many places were a network of wires. The damage to the entire wire system along the center of the storm's path was complete. The percentage of loss grows less as the distance from the central line increases. On the outskirts of the belt only a pole here and there was blown down.

The Edison Illuminating Company lost over $100,000 in material. This company is a sort of tripartite concern, owning two other companies—the Missouri and the Municipal Electric Light and Power companies. Through them it derived its contracts with the city. The arc-lamp lighting for the streets is also done by the Edison, as also the incandescent-lamp lighting in the alleys and public buildings south of Washington avenue. The incandescent lighting north of that street is done by the Laclede Gaslight Company. Manager Pike, of the Edison company, is authority for the statement that his company lost about 1,000 poles. This estimate was made the second day after the storm. Lamps and wires went with the poles. The salvage will not be 10 per cent of the whole. Five hundred men were put to work next day cleaning up and stringing new wires. Forty car loads of poles arrived yesterday. Good progress is being made, but it will be several weeks before the entire street and alley lighting system in the storm-stricken district is completely restored. Even the streets in the northern half of the city are still in darkness at night. The alley lighting there was resumed Friday night, the storm having occurred Wednesday afternoon, but the Laclede company's storm loss was comparatively light. Its plant, at the foot of Mound street, near the river in north St. Louis, was not damaged much. The trunk line of wires running from the plant to Broadway was demolished, the mammoth poles snapping off like pipe-stems. The Laclede company's business, both private and public, has been fully restored. Returning to the condition of the Edison company's system, it may be said that the delay in starting up the arc lamp lines in the streets of the northern half of the city was due to the destruction of two or three trunk lines near its power house on Nineteenth and Gratiot streets and to damage done to the plant itself. The building lay in the storm belt. The machinery was not damaged much, but the building was considerably. The lighting of the streets north of Washington avenue will probably be resumed this evening. Some of the street and alley circuits in the southern half of the city will be lighted again next week.

The Edison's private business outside of the storm district has been resumed—incandescent lights on Friday night last, the power furnishing business the following day and the arc lighting for commercial purposes on Saturday night.

The damage sustained by the other electric light and power companies of the city was comparatively light. The St. Louis Electric Light and Power Company lost the smokestack of its power house—on Third street and Lucas avenue, one block north of Washington avenue — and several miles of wire and poles. The company furnishes both power and light. Most of its customers are being served now as before the storm.

The Edison General Electric Company and the Laclede Power Company, separate concerns from the Edison Illuminating and the Laclede Gaslight Company, were not damaged very much and both are running again. The Laclede Power lost about a mile of poles and wire.

The loss to the Bell Telephone Company will be fully $100,000. About 500 of its poles were blown down, most of them broken in two. The telephone service throughout the city was disabled for a day or two, and in only the northern half of St. Louis have many lines been repaired. New circuits are being added daily, and in a couple of weeks more even the greater portion of the storm territory will enjoy telephone service. Several gangs of workmen are putting up poles and stringing wire by calcium light at night. The Bell company's loss in East St. Louis was complete. Practically everything there was swept away that belonged to the company. About 100 men are at work repairing the damage across the river. The company's telephone lines in the suburban cities and towns were damaged very little and are now working as usual.

The St. Louis Fire Department lost about 100 miles of wire and 50 fire-alarm boxes. Some 200 boxes were blown down with the poles to which they were attached, but most of them can be used again. The Fire Department strings its wires on private poles. Only three of the city's 35 engine houses were left in service by the storm, the circuits of the others having been broken and one house completely demolished.

The city has several messenger call companies, but their loss was light. They string their wires on house-tops and therefore lost no poles. Every company lost, however, considerable wire.

The Western Union and Postal Telegraph companies were badly disabled for three or four days. Each has a trunk line of poles running westward from the heart of the city that was wrecked for a distance of several miles. The Postal company's subway system is only about a mile long. The trunk lines destroyed have all been replaced and many of the single side lines.

All the street car companies suffered from the storm. The entire street railway system here is electric, with the exception of three cable lines. Only one of the latter was badly disabled, the power houses of two being outside of the storm belt. The Union Depot Street Railway Company suffered the worst. Its three southern lines have not been fully restored yet, although two of them were operated for a time yesterday. The company's power house on Geyer and Jefferson avenues was completely demolished, the ruins burying the machinery. After six days' digging the debris was removed and one of the dynamos found in fairly good working order. One of the company's North St. Louis lines, the Benton-Bellefontaine, continued running through the storm, and it is the only street-car line in St. Louis that did. This company's other lines—Grand Avenue, Fair Grounds and Mound City—resumed business in a couple of days.

The Lindell company has two power houses and operates eight lines. One power house was badly damaged, but both are now in operation, and also every line, except one, from end to end.

The Southern Electric resumed operations Monday, as did the Southwestern and the Jefferson avenue line. The Missouri company operates three lines from one power house. The latter was badly damaged, and the first of the three lines started up only on Monday, five days after the storm. The other two are now running, one being the Jefferson avenue line. Fortunately, most of the power houses were outside of the path of the storm. All trolley lines in the path were blown down wholly or in part. The poles for the trolley wires are all of iron. Some were snapped off and others blown down. By to-morrow or next day the city's entire street-car system will again be in operation.

The total loss sustained by all the wire-using companies of the city, and the municipal, police and fire-alarm departments, will probably reach $500,000, not including loss of business.

W. A. K.

St. Louis, Mo., June 3.

THE FINANCIAL SIDE.

There is no question that electricity will be the motor power for the new Manhattan, and it is quite probable that General Electric will receive the contract. I am told that this company is now negotiating a plant for the Thirty-fourth street ferry line, which will be largely of a test nature, and it is quite probable that the installation will occur this Summer. As for air motors, at best they are only in the experimental stage, and do not appear to be favored by the Elevated company.

Much stress has been laid upon the preparations being made to operate the Hoadley air motor on the Lenox avenue line. I am authoritatively informed that these operations are at the expense of the manufacturers, and that the company is indemnified for damage. In other words, it recognizes that the apparatus is only in experimental stages.

There was but little feature in General Electric stock this week. It declined about 2 points from high and rallied one-half that amount. At no time was it active. It has many believers who are prepared to buy it at the right time. There have been no developments in the week regarding the preferred stock. The commencement of a suit to force the payment of back interest is expected before long.

Electric Storage Battery securities were weak in Philadelphia at disclosures made at the annual meeting. The nature of these has been strictly guarded. The declines were 4 points up to Thursday. Subsequently there was a partial rally. Despite the denial of officials, it is known that the storage battery tests on the Fourth avenue horse-car line have not been satisfactory to the railroad company, and that they have been discontinued.

At the annual meeting of the Westinghouse Electric, held in New York this week, the proposed increase in the capital stock from $10,000,000 to $15,000,000 was authorized. Proceeds will be used to meet extension already made.

The Erie Telephone Company has disposed of $1,000,000 of its proposed $4,000,000 bonds to a German syndicate which has taken an option on the balance.

Now that the patent pool has gone into effect, all patent suits between the two big electrical companies have been discontinued and the board of control authorized to prosecute infringements on behalf of the companies.

On the Boston Exchange, Bell telephone was steady at 206; Erie telephone at 59½ and New England telephone at 91. Westinghouse common was quoted at 29 @ 30, and the preferred 52¼ @ 52¾.

The lease of the Fourth avenue horse-car line by the Vanderbilts to the Metropolitan Traction Company will be concluded within a few days. The lessee examined the books of a lessor before consummating the deal, and was satisfied that every leased line in the system is earning a surplus for the Traction company after rentals and charges are figured; also that the surplus earnings of the system applicable to the stock are just double what they were during the corresponding period of 1895.

New York, June 6. BAIN.

STEAM BOILERS: THEIR EQUIPMENT AND MANAGEMENT.

READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, MAY 7, 1896, BY ALBERT A. CARY.

(*Continued from page 294.*)

In order to acquaint you with the details of the mechanical induced draft, with its regulating devices, I will describe the plant I have already referred to—the first one ever erected and operated in this country.

Fig. 1 shows the front and side elevation and plan, which consists of five horizontal return tubular boilers and one vertical boiler, all having a total rating of about 600 horse-power. Examination will show that the main smoke flue, receiving the gases discharged from these boilers, is located directly above their rear ends; the smoke, etc., is conducted from the rear of each boiler to this flue by individual wrought-iron pipes or flues. After the discharged gases reach the main flue, they can travel in either direction, right or left, to the chimney, their direction of movement being controlled by the position of the two dampers marked D D, which swing on their respective hinges H H. By means of this regulation the gases can be made to pass through the economizer, or, they can, without passing through it, be made to travel from left to right (see front elevation) and escape to the chimney direct from the opening at the extreme right.

The exit shows the damper at the left open, while the one at the right is closed. The gases thus travel from right to left, and then pass upward into the economizer. After passing through it, giving up their heat to the feed-water contained therein, they plunge downward at the right, into the outlet flue, from whence they proceed to the fan, being drawn into it by its suction. After passing through the fan they are discharged, under pressure, up the chimney, from whence they escape in the usual way. This gives a general idea of the working of this system, but we must also examine the details to understand the points which make it highly efficient. In the first place I was obliged to devise a means to keep my bearings cool and to make effective lubrication possible, as the heated gases had a tendency to raise the temperature of the shaft to a dangerous degree. I overcame this by using for a shaft a heavy six-inch weldless steel tube and I passed all the feed-water for my boilers through it. Fig. 2 shows the packed joint I used for this purpose, one being used at each end of the hollow shaft. This is merely an adaptation of the well known piston-rod stuffing box, the soft packing being placed in the space marked C.

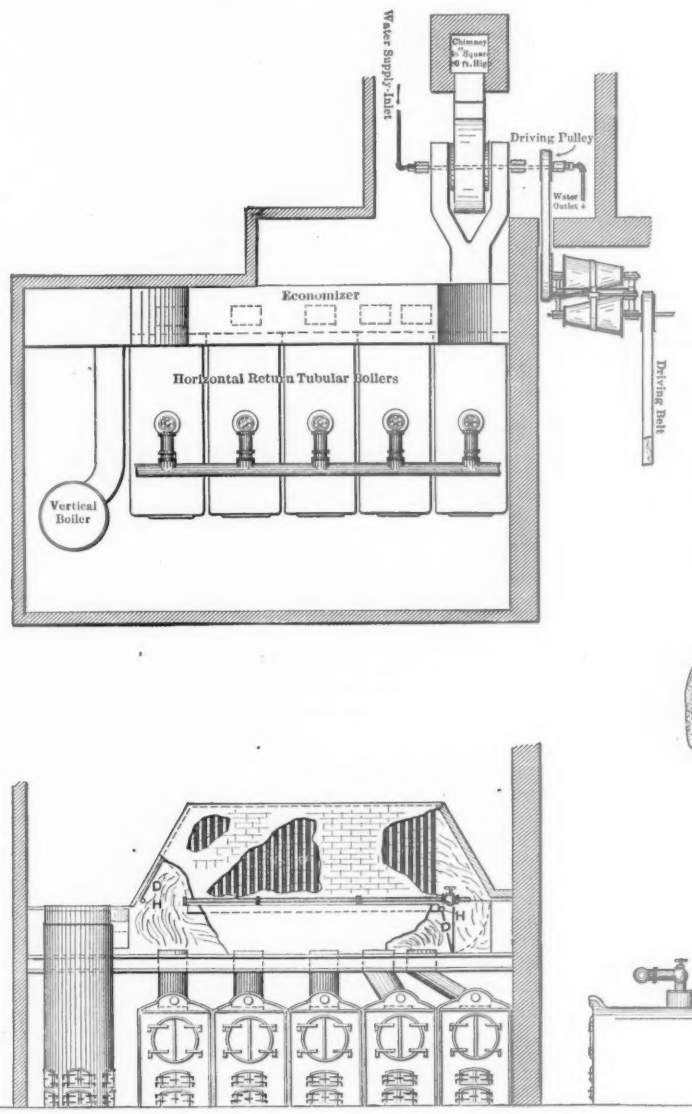
The speed-regulating device for the fan is shown in the plan view of Fig. 1, and consists of a pair of speed cones, which cause the fan to revolve at different speeds as the belt connecting the two cones is shifted from one end to the other.

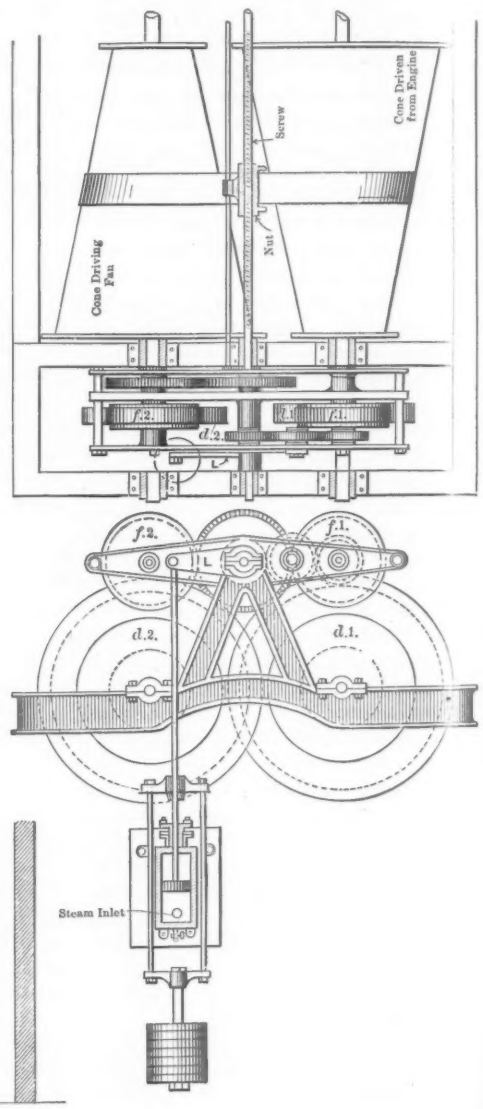
Fig. 3 shows in detail the manner in which this belt-shifting is accomplished. By examining the plan view, you will see that I placed a screw above the center of these two cones, carrying a nut, which, in turn, carried a belt-shifting device. Of course, when the screw is revolved in one direction, the nut (which was prevented from revolving by means of a rod running parallel to the screw) would move in one direction along the length of the cones, carrying the belt with it. When the screw was revolved in the opposite direction the nut traveled in a reverse direction to that just described. The revolutions of the screw and its direction of turning are regulated entirely by gearing, which is revolved by either one or the other of the two friction disks, *f* 1 and *f* 2. (See plan and elevation.) One or the other of these friction disks is brought in contact with corresponding disk wheels located directly below them. Contact of *f* 1 with *d* 1 causes the screw to revolve in one direction while contact between *f* 2 and *d* 2 causes the screw to revolve in an opposite direction. This alternate contact of the different pairs of friction disks is accomplished by means of a damper regulator (shown in position in the side elevation). The steam cylinder here is shown in section. The steam enters through the opening marked steam inlet, and if its pressure against the bottom of the piston is sufficient to overcome the weights (suspended from the cross-head on the piston-rod) the piston will rise and make a contact between *f* 1 and *d* 1 by moving the "walking-beam" arrangement around the main screw shaft. If, on the contrary, the weights are able to overcome the steam pressure against the under side of the piston, the piston will descend and a contact will be made between the friction disks *f* 2 and *d* 2, causing the screw to revolve in the opposite direction. Thus you will see that any drop in steam pressure will cause the fan to revolve more rapidly, inducing a greater draft and thereby intensifying the fire while a rise in steam pressure will produce just the reverse effect. In the plant under consideration, the speed of the fan had a range of from 100 to 1,000 revolutions per minute.

There are many necessary considerations to be taken into account in the installation of a mechanical induced-draft system, and one of these, of no small importance, is to provide means for preventing a sudden inrush of cold air into the boiler when the fire doors are open for stoking or cleaning. Such an inrush, when the fan is revolving rapidly, produces a sudden chilling effect throughout the boiler, causing a great waste of fuel, to say nothing of the tremendous strains to which parts of the boiler are thereby subjected, causing, eventually, leakage and destruction.

To overcome this trouble I introduced a device which is illustrated in Fig. 4.

The right-hand fire door overlaps the door on the left and, therefore, had to be opened first. Through the hinge of this right-hand door I placed a piece of gas pipe, keying it in place, so that it turned as the door was opened or shut. I continued this pipe upwards, above the top of the boiler, as shown, and on its top end I placed a crank, which was attached to a rod running back to the stem of the damper, this damper being placed in the individual flue connecting this boiler to the main flue. By this arrangement, when the door was opened for stoking or cleaning, the





FIGS. 1 AND 2.—FRONT AND SIDE ELEVATION OF 600 HORSE-POWER BOILER PLANT. PACKED JOINT FOR FEED-WATER.

FIG. 3.—BELT-SHIFTING ARRANGEMENT.

damper was closed at the same moment, thus accomplishing the results required.

I have made a number of other highly successful applications of this mechanical induced-draft system, and new problems appear in almost every case. In applying it where a steam engine is connected directly to the fan shaft, I use this damper-regulating device in connection with a throttling governor, doing away, of course, with the revolving mechanism of the governor.

In case an electric motor is to be used, direct-connected or geared, I use the same damper-regulator, which operates a rheostat, through which the speed of the motor is governed.

Before closing this subject of regulated, mechanical induced draft, I would say that there are many electric light plants in which this system can be used to great advantage without the addition of the economizer, which will materially reduce the cost of installation. In some of these plants we find the extreme maximum load lasting but two or three hours each day and it will be merely during these times that the excessive temperature of flue gases exists.

After all, the matter of introducing any appliances to the steam plant resolves itself down to a simple commercial problem. Taking the matter of first cost and cost of installation, to which must be added the cost of maintenance, we can easily figure the interest on the investment. Next, after carefully considering the appliance and securing, by personal investigation, the true results of others' experience, you can determine, with close approximation, the real saving the appliance will make to the plant. Next, balance up and you will then be able to determine whether it is advisable for you to invest or not.

One of the most important considerations in designing an electric light station is its equipment in such a manner as to secure the least possible interruption to continuous and unvarying service. In no place in the station should this consideration be heeded with greater care than in the boiler room. This is the very heart

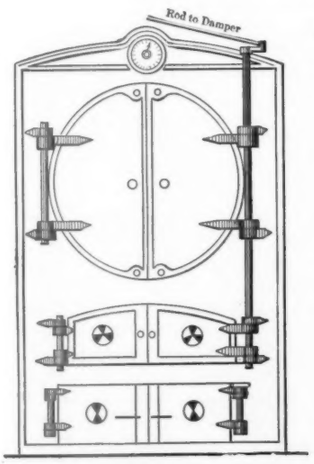
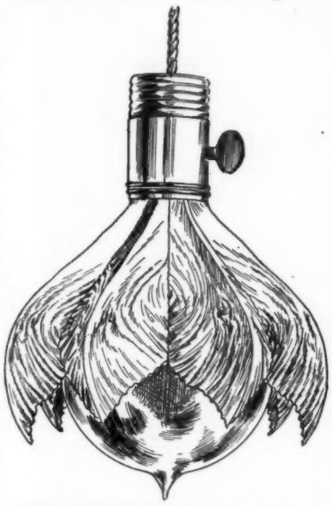


Fig. 4.—Device to Prevent Inrush of Cold Air.

of the whole plant, and, when anything happens to the boilers or their appurtenances, the entire station is affected, and, in some cases, "shut down." A little investigation will prove to you, when striking an average, that the stations provided with the best boiler houses are the ones that are showing the best economy and such stations are the best dividend payers. The situation of the steam plant is a matter of no small importance, and this is a matter, when choice of location is possible, which needs careful consideration. Carting fuel and ashes is a costly operation, and as much of this as possible should be avoided. Location on a navigable water front is most desirable, where coal can be delivered to the boilers with a minimum amount of handling. Location on a railroad is also a desirable situation, where coal cars can be run on a private



"Novelty" Paper Shade for Incandescent Lamps.

switch to a convenient point for handling the fuel. A place, of course, should be provided for storing, at least, a fairly good supply of coal, and such stored coal should be well protected from sun and rain, as this protection will make a considerable difference in the value of the coal when burned. Certain progressive concerns, occupying valuable ground space, have recently had erected large vertical cylindrical iron tanks in which they store considerable amounts of coal. Of course, the cost of ground space cuts a considerable figure in this choice of a location for a steam plant. It is easy, however, to compute the interest on the difference of cost between a most desirable site and one that is less desirable, and then calculate the difference in operating expenses in the two places. Room for extension must always be provided for. How many plants there are which have not considered this important matter, and have, sooner or later, found themselves badly handicapped in consequence. Good foundations are most desirable, but they are not always obtainable in a comparatively cheap manner. This is a very important matter which should be carefully considered, and I have often found that it payed well to employ some one making a business of driving tube wells, to prospect thoroughly an eligible site, and thus determine beforehand exactly the nature of the ground and so get at, closely, the cost of the foundation work.

Recent practice in electric light stations has brought to the surface the question, when considering a station several stories in height, is it best to place the boilers in the basement or else on the upper floors of the building? This is matter more of local consideration rather than one which could apply to all cases. Where the cost of real estate is high, and where good foundations for the building walls are obtainable, experience seems to point to the advantage of placing the boilers in the upper stories, thus leaving the lower story for foundations for the running machinery.

In designing a plant, one or more spare boilers should invariably be provided. Every possible accident should be carefully anticipated and provision should be made to make even a partial stoppage of the plant impossible. In a small plant no less a number than two boilers should be used, on the principle that it is not safe to "put all your eggs in one basket." In deciding how many extra boilers should be needed in a plant, the ease and rapidity with which repairs can be made with the facilities right at hand and with the special type of boiler used should be considered. You must remember that you are liable to be called upon at any time—day or night—to get one or more of your boilers back into working condition again. Supposing you have a breakdown which can be repaired in a few hours, you can safely work the balance of your plant considerably above its rating for this short time, to help you through your trouble, that is, if the original rating of your boilers has not been placed too high. Ample heating surface is very telling under such trying circumstances. You should always provide for sufficient boilers to allow one or more to be laid off constantly for cleaning. The number of boilers provided for this purpose is governed greatly by the quality of the feed-water used and the care which is taken to purify the feed-water and make it fit for boiler use. The spare boiler for cleaning is a very paying investment where the available feed-water is bad, as it means the saving of very large quantities of coal.

(To be continued.)

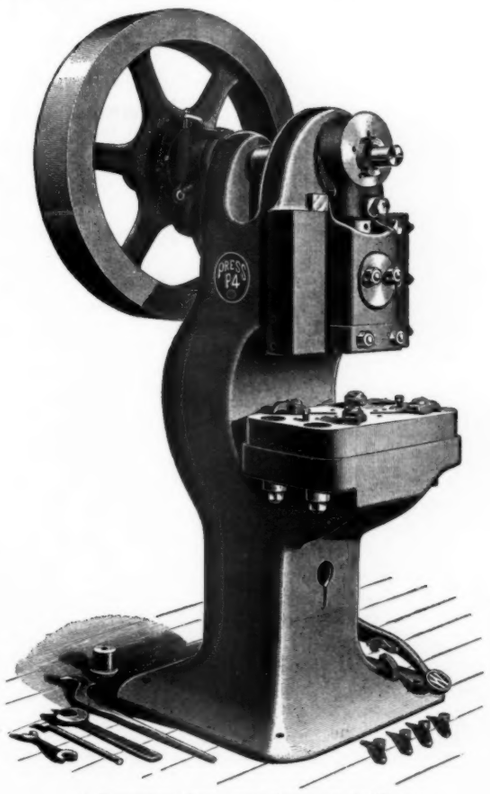
Paper Lamp Shades.

The accompanying illustration shows a novelty lamp shade recently placed on the market by A. A. McCreary, 136 Liberty street, New York city. They have a pretty decorative effect, and also keep dust and dirt from falling on the lamp. They are made in eight colors and in white, and are sold at a very reasonable price.

"Dreams and Their Mysteries," and the scant attention bestowed by science upon the wonderful phenomena of sleep, forms the theme of an able and thoughtful paper by Elizabeth Bisland in the *North American Review* for June.

A Punching Press for Instrument Work.

The accompanying cut shows a new design of punching press recently introduced by the Ferracute Machine Company, of Bridgeton, N.J. It is one of a series of six sizes of presses, the smallest weighing about 1,050 pounds and the largest about 10,000. This particular press weighs about 4,300 pounds and gives a pressure of 52 tons. It has a flywheel 40 inches in diameter and weighing 1,100 pounds. The hole in the bed of the press is 8x10 inches. It is used in cutting out various thick articles, such as parts of instruments, and for general cutting, punching and forming, etc. It is known as P4, and it and the small size press, P3, have proved very popular for electrical work. It is massive in design, and all of the parts are very heavy. The ram bearings are unusually long and wide for accuracy, and there is an improved form of automatic clutch and graduated adjustment for the ram. There are also a number of features in the way of treadle lock, clutch lock, self-oiling device for flywheels, etc. These various points seem to be appreciated by the electrical instrument manufacturers.



A Punching Press for Instrument Work.

The Ferracute Machine Company makes a large line of presses and issues a catalogue describing 300 different kinds, a number of which are especially adapted for electrical work. They had one of the presses shown running in their exhibit at the New York Electrical Exposition; also a smaller size of press, same style, with indexing attachment for notching armatures; also one of their cutting presses. These presses were fitted up with motors and dies to illustrate the working of sheet metal for electrical goods.

TELEPHONE NEWS AND COMMENT.

The Western Telephone Construction Company, of Chicago, has shipped a 400-telephone exchange equipment to the Mutual Telephone Company, of Petersburg, Va.

The stockholders of the Bell Telephone Company, of Philadelphia, have voted to increase the capital stock from $1,000,000 to $2,000,000. The additional capitalization will be used in extension of the company's business.

Judge Colt, in the United States Circuit Court at Boston, has given the National and Century telephone companies until November 1 to take testimony as defendants in suits of the American Bell Telephone Company, which claims an infringement of the Berliner patents.

The Erie Telegraph and Telephone Company has sold $1,000,000 of its proposed $4,000,000 five per cent bonds to a German syndicate, which has taken an option on the balance of the bonds at the same price, in case the Erie company decides to use the additional money. A second million bonds may be sold to retire the present six per cent bonds.

The switchboard and instruments for the Western Telegraph and Telephone Company's exchange at Auburn, Ind., have arrived and the line work is nearly finished. The company is said to have the names of 50 subscribers on its list. The Central Union Telephone Company is also busily at work installing a system in Auburn. They are reported to have booked less than a dozen subscribers. Auburn is a small town and the people are wondering how two exchanges in opposition to each other are going to live.

The Pittsburgh *Dispatch* recently published the following: "The largest contract for telephones ever made in the United States was concluded recently between Burt Hubbell, secretary of the Keystone Telephone Company, of Pittsburgh, and Colonel J. S. James, president of the Atlanta Telephone Company, of Atlanta, Ga. The contract includes the furnishing of 10,000 telephone instruments at a cost of $300,000. The Atlanta company is a strong independent anti-Bell company and already it has contracted with 2,800 subscribers in Atlanta to use its instruments for five years at an annual rental of $36 per year. It guarantees to take 10,000 telephone instruments within a year, and expects to have 7,000 patrons within six months. The American Bell company has but 1,400 subscribers in Atlanta and charges a uniform rate of $84 per year. Colonel James is United States District Attorney of Northern Georgia."

The growth of the telephone business for the next few years bids fair, judging from the output of the Bell instruments, to far exceed the past, although that has been phenomenal, says the Boston *News Bureau*. The increase of subscribers by the sub-companies thus far in 1896 is much greater than the increase for the same months last year. Toll-line extensions are being made to every village and hamlet. The companies find that small communities, unable to support telegraph offices or even a railroad station, can maintain a "telephone toll station." The toll station is generally located at the post office or country store, and the postmaster or proprietor is allowed a commission for giving the business attention. These extensions, as well as the extensions to large cities, and the increasing of facilities between points already connected, require considerable capital, hence the necessity of the sub-companies to increase their capital stock or issue bonds, and the American Bell Company to issue new stock to take its proportion of the new stock issued by the sub-companies for the development of the business. All that is necessary is for the management to invest the money in channels remunerative, and, if the investment can be well made, any excess of earnings above the cost of money will go to the benefit of the stockholders. With the original plant already established, the extensions ought to be made to return quite a handsome income above the cost of the money. Last year the New England company put in 4,787 exchange and private-line subscribers, and the Erie company 2,417. It would not be surprising to see the New England company increase 6,000 subscribers this year and the Erie company 3,000. At the end of 1896 the companies would have, including their private-line and toll connections, New England Company, 37,000; Erie Company, 29,511. This does not include the benefit the company may derive by the changing over of grounded-circuit subscribers to the long-distance metallic service.

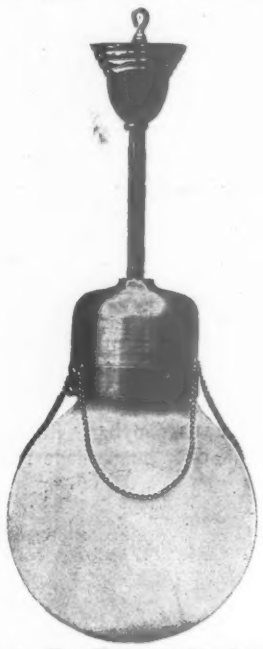


FIG. 1.—THE NOWOTNY ARC LAMP.

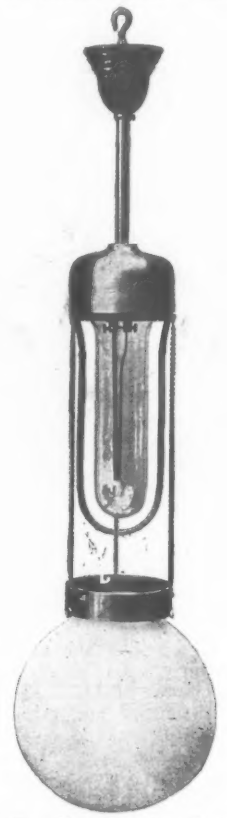


FIG. 2.—THE NOWOTNY ARC LAMP WITH GLOBE SUSPENDED.

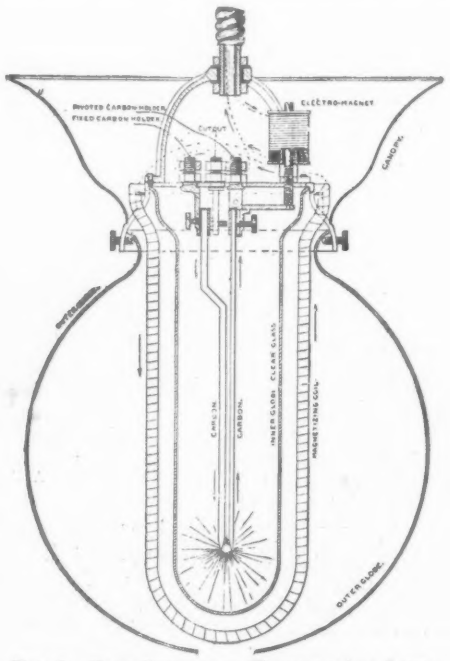


FIG. 3.—CROSS-SECTION OF NOWOTNY ARC LAMP.

The Nowotny Arc Lamp.

In the accompanying illustrations is shown a novel type of arc lamp made by the Nowotny Electric Company, 208 to 212 Lawrence street, Cincinnati, Ohio. The main features of the lamp are enumerated by the manufacturers, as follows:

The carbons are placed parallel to each other throughout the entire length which is to be consumed by the arc. The carbons are flat, two flat sides being close to one another.

The arc is kept at the tips of the carbons by the use of a magnetic field. This field is generated by a coil which lies in a plane parallel to the axes of both carbons.

The carbon holders and carbons are incased in a single glass globe to protect them from the access of fresh air, thus greatly prolonging the life of the carbons.

The only moving part of the lamp is one carbon holder, which is pivoted so as to move sufficiently to allow the carbons to come into contact at their tips or to separate to the distance necessary for the required arc.

A single solenoid magnet is provided to draw up an arm, fastened to the pivoted carbon holder so as to separate the carbons and form the arc.

This lamp is manufactured for arc, constant-potential, continuous and alternating-current circuits. It is claimed that it is simpler, more reliable, gives a more uniform and steady light with a less amount of attention and a less consumption of carbon than any other lamp on the market. It is said that this lamp casts no shadow and occupies little room. It is claimed to be the shortest lamp made.

It has no rods, no sliding contacts, no chimney, no clock work, no springs. It is provided with an automatic cut-out. It is easy to trim. It is ornamental.

An Exhibition of Modern Photography at the Electrical Exposition.

The exhibition of Geo. P. Hall & Son, photographers, of New York city, at the Electrical Exposition was a most interesting illustration of the importance of commercial photography.

The senior member of the firm having been identified with photography since its infancy, they have developed methods for accomplishing the best effects and, for certain expert work, have perfected special apparatus of their own design and are distinctly specialists, embracing every line except portraiture. They operate 23 cameras, ranging from 4x5 to 26x40 inch plates with 35 lenses, having special plates made for their use, one order for which was for three tons, the largest ever given by a photographer. The main office of the company is at 57 Fulton street, New York, with a system of correspondents throughout the country, through whom they are able to expeditiously secure photographs. Particularly in the electrical and mechanical work the company is favorably known, as photographing machinery and apparatus has had their special consideration.

ADVANCE INFORMATION

Valuable News and Tips for Manufacturers and Dealers.

We publish below information relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW.

New Electric Railways.

PALMER, MASS.—The directors of the Palmer Street Railway Company are trying to interest capitalists in a proposed electric road to connect the four villages of the town.

MONTCLAIR, N. J.—A proposition has been made to the Town Council to build and operate in this place an electric railway on the underground system.

FRANKLIN, N. J.—Gen. Bird W. Spencer, president of the Passaic & Newark Electric Railway, has applied to the Town Committee for a franchise for a trolley road from this place to Bloomfield.

UNIONTOWN, PA.—The stockholders of the Uniontown Street Railway Company have decided to extend their lines three miles, to Brownfield, via Hopwood and Leith, provided they can sell $20,000 of new stock to build it.

ALLEGHENY, PA.—The Allegheny Traction Company will extend its lines from this place to Butler some time during the year, at a cost of over $500,000. The line will be only 31 miles long.

BOSTON, MASS.—Mr. Barnes, of Chelsea, has introduced in the House a bill to incorporate the Lancaster Elevated Railroad, with a capital of $1,000,000, with allowance for an increase of another $1,000,000 with the consent of the Railroad Commissioners. The proposed route is from the Union Station through Causeway, Atlantic avenue and Federal street to the site of the proposed new Union station; thence through Essex, Harrison avenue, Eustis and Hampden streets to Franklin Park. Another route is from Franklin Park to the proposed Back Bay Station. The incorporators are W. W. Kimball, J. F. Lancaster, J. F. Merrill, James Armstrong, B. F. Peach, J. R. Graham.

EXHIBIT OF THE CLONBROCK STEAM BOILER COMPANY, OF BROOKLYN, N. Y., AT THE NATIONAL ELECTRICAL EXPOSITION, NEW YORK.

NEW HAVEN, IND.—An electric railway will soon connect this place and Fort Wayne.

MERIDEN, CT.—Ex-Judge A. Heaton Robertson, of this city, purchased the Meriden, Waterbury & Connecticut River Railroad, which was sold at auction at Hartford, for $.80,000.

PENSACOLA, FLA.—The horse cars are to be equipped with electricity.

TRENTON FALLS, N. Y.—The Trenton Falls Electric Motor Company will construct stone dam, at a cost of about $100,000. Wm. Fox, contractor, can give information.

LANGHORNE, PA.—Langhorne Trolley Company's stockholders have voted an increase in stock of $60,000, to extend the line to Hulmeville.

BRENTWOOD, MO.—The Highland Scenic Railway Company has been incorporated by James D. Houseerman, Jr., Earnest Marshall, J. J. Broderick, L. B. Jones, W. F. Richards, to build an electric railway. Capital stock, $150,000.

COLUMBIA, S. C.—The Columbia & Eau Claire Electric Railway Company has been incorporated by F. H. Hyatt, Chas. W. McCreery, W. A. Clark and Chas. W. Muller. Capital stock, $50,000.

SYRACUSE, N. Y.—The Syracuse Rapid Transit Company has been incorporated by John Alvin Young, Jersey City, N. J.; Ansel L. White, Geo. F. Brown, David N. Darling, and others. Capital stock, $4,000,000.

SYRACUSE, N. Y.—The Lakeside Railway Company has been incorporated by John S. Kaufman, Austin C. Chase, Bruce S. Aldrich, W. Judson Smith, Edward A. Powell, Patrick R. Quinlan, Wm. A. Gallup, Wing N. Smith and Howard Bab-

EXHIBIT OF GEORGE P. HALL & SON, OF NEW YORK CITY, AT THE NATIONAL ELECTRICAL EXPOSITION, NEW YORK.

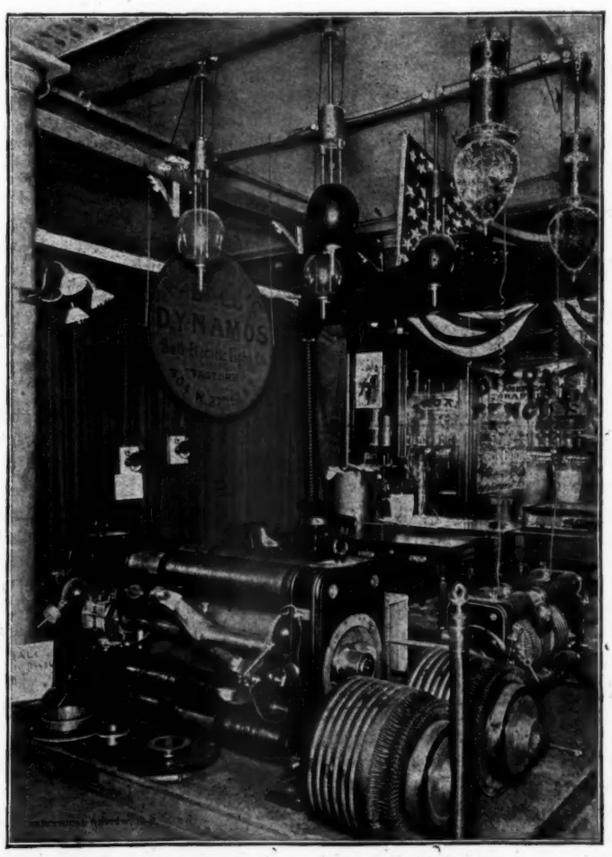


EXHIBIT OF THE BALL ELECTRIC LIGHT COMPANY, OF NEW YORK CITY, AT THE NATIONAL ELECTRICAL EXPOSITION, NEW YORK.

AVOCA, PA.—The Scranton & Pittston Traction Company will erect a new power house, and work will begin soon.

Electric Light and Power.

BENWOOD, W. VA.—An electric light plant is to be established here, backed by private capital.

HENDERSON, IND.—By the first day of August next this city will have an electric light plant that will cost $32,000.

MIDDLESEX NARROWS, VT.—The Viles electric light plant at this place is now running 1,200 incandescent lights in this city.

NEWTON, N. Y.—Commencing June 1 this place will be lighted by 72 arc lights, to burn all night.

WILMINGTON, DEL.—Garrett, Miller & Company and the Westinghouse Electric Company have finished a complete electric light plant for the McCullough Iron Company's works. The new plant has a capacity of 500 incandescent lamps.

CHICAGO, ILL.—The West Park Board has decided to illuminate all the west side parks with electricity. It will cost $85,000 and the bids have already been awarded.

MERCUR, UTAH—Captain De Lamar has purchased franchise for an electric light plant of George Brown. Work of construction will begin immediately.

MILWAUKEE, WIS.—City Engineer Benzenberg can give information concerning construction of electric light plant, for which estimates have been made, approximating $400,000.

NEW YORK, N. Y.—Bids were invited by the Peruvian Consul in New York, until June 1, for an electric lighting franchise at Lima, Peru.

SAN ANTONIO, TEX.—E. R. Norton, City Clerk, may give information concerning lighting of streets with arc electric lights.

BELLEVUE, IOWA—W. E. Schermer, Recorder, may be addressed for information concerning construction of electric light plant.

ST. MARY'S, ONT.—L. Harstone, Clerk, may give information concerning lighting of streets with electricity for a period of 10 years.

MCLEANSBORO, ILL.—An electric light plant is to be constructed. The Mayor will give information.

FRONTENAC, KAS. — The City Clerk may be addressed for information concerning construction of electric light plant.

MUSCATINE, IOWA—The Muscatine electric light plant damaged by storm.

NAZARETH, PA.—The Nazareth Electric Light and Power Company, C. Miller, president and manager, will erect a new power house.

QUINCY, ILL.—The Smith Hill Machine Company will shortly commence the manufacture of electric motors. C. J. Sturgeon will have charge.

KNOXVILLE, TENN.—The Mutual Light and Power Company, W. G. McAdoo, has secured contract from the corporation of both West and North Knoxville to furnish them lights for the next 10 years at $80 per light per year.

GREENVILLE, MISS.—The Greenville Light and Car Company has been incorporated by Arthur Hider, James Robertson, John B. Scruggs, J. J. Harty, N. Goldstein and J. A. Gaboury, to erect and operate electric light plant, etc. Capital stock, $100,000.

CRAWFORD COUNTY, MO.—L. A. Moffett and James G. Cozzens, of St. Louis, have completed arrangements for the construction of a big water power plant to develop and transmit electricity.

ANDERSON, S. C.—The Anderson Water, Light and Power Company will expend $100,000 in developing the water power of the Seneca Shoals, on Seneca River, and erecting an electric plant to transmit the power.

POCAHONTAS, VA.—The Southwest Virginia Improvement Company is adding an electric light plant.

TOPEKA, KAS. — Topeka Water Company has been incorporated with Wm. C. Eaton, president, Harry W. Verrill, of Portland, Me., to manufacture electricity, gas, etc. Capital stock, $1,500,000.

ASBURY PARK, N. J.—Atlantic Coast Electric Light Company has been incorporated by John E. Comins, Arlington, N. J.; Arthur D. Chandler, Orange, N. J.; John B. Summerfield, Brooklyn, N. Y. Capital stock, $50,000.

PRESTON, MINN.—Eighteen thousand dollars worth of bonds will be issued to construct waterworks and electric light plant.

NEW YORK, N. Y.—The Electric Power Company property has been purchased by Erastus Wiman for $110,000. He will reorganize and remodel the Electric Power Company.

BANGOR, ME.—The General Electric Company has offered to install 240-light plant for $6,000, to take the place of the present plant.

HELENA, MONT.—The Helena Water and Electric Power Company has been incorporated by S. T. Hauser, S. M. Holter, T. A. Marlow, of Helena, and others. Capital stock, $200,000.

PITTSBURGH, PA.—The Allegheny County Light Company will erect a new dynamo and engine room at a cost of $47,000.

SPRINGFIELD, MASS.—The United Electric Light Company has filed a petition with the Gas and Electric Light Commissioners, that it may issue $200,000 more bonds, $10,000 to pay indebtedness and $90,000 for extensions.

ST. LOUIS, MO.—The St. Louis Electric Light and Power Company have increased their capital stock from $75,000 to $200,000.

OGDENSBURG, N. Y.—Harvey L. Jones, City Clerk, can give information concerning electric light plant.

PORTLAND, MICH.—An electric light plant is to be constructed. Bids for same now being invited. H. H. Humphrey, engineer, Detroit, may give information.

FREEPORT, L. I., N. Y.—Steps are being taken to establish an electric light plant.

CAMERON, MO.—The electric light plant is to be improved. James A. Haskett, of Kansas City, Mo., is reported to be preparing plans for same.

RIVERSIDE, CAL.—A. C. Willard can give information concerning the construction of an electric light plant.

ST. PETERSBURG, FLA.—The West Coast Development Company is reported as having been granted franchise for an electric light plant and waterworks.

DOVER, N. J.—The Dover Electric Light Company is inviting bids for the purchase of bonds for extending the plant.

DALTON, MASS.—W. L. Tower, architect, is interested in construction of electric light plant of about 2,500 incandescent lights capacity, for which a company is being formed.

PHILADELPHIA, PA.—The Equitable Illuminating Gas Light Company has been incorporated by Warwick M. Ogelsby, treasurer. Capital stock, $1,000.

KNOXVILLE, TENN.—The Mutual Light and Power Company has filed articles of incorporation.

JUNEAU, WASH.—Willis Thorp has sold the Juneau electric light plant to Robert Duncan, Jr., A. W. and J. P. Corbus. The new company will increase the capacity.

MCCOMB, OHIO—The McComb Council is considering several propositions for lighting this town by electricity and will probably have an illuminating plant there soon.

GREENWICH, N. Y.—The Consolidated Electric Company have made a contract with the trustees to light this town for five years. The appropriation for this is $1,897.50.

NEWARK, N. J.—The Newark Electric Light and Power Company will erect a large and modern power house.

DUNKIRK, IND.—The Dunkirk Electric and Power Company has been incorporated. The capital stock is $20,000.

New Telephone and Telegraph Companies.

YOUNGSTOWN, OHIO—The Youngstown Telephone Company has been incorporated. Capital stock, $60,000.

JANESVILLE, WIS.—The Postal Telegraph Company has applied for a franchise at this place as a competing line with the Western Union.

PITTSBURGH, PA.—A Pennsylvania official says that within the next year that company will have in operation along its line long-distance telephones connecting all important stations between this place, St. Louis and Chicago.

WASHINGTON, D. C.—The United States Long-Distance Telephone and Telegraph Company has been incorporated with F. B. Hubbell, president; James Russell, treasurer, and W. J. Atkinson, secretary and general manager. Capital stock, $1,000.

MEYERSDALE, PA.—The Bell Telephone Company has agents in this place negotiating for the purchase of the local telephone plant, with the object of extending the line to points in Maryland.

FARMINGTON, ME. — The New Sharon & Norridgewock Telephone Company has been organized for the purpose of constructing and maintaining a telephone line from New Sharon to Norridgewock, with $10,000 capital stock, of which nothing is paid in. The officers are: President, Henry S. Leeman, of Starks; treasurer, Fred C. Hale, of New Sharon.

BALTIMORE, MD.—The United States Long-Distance Telephone and Telegraph Company has been incorporated. Frederick B. Hubbell, James Russell, William J. Atkinson and J. Markham Marshall, of Baltimore, and Cecil R. Atkinson, of Chestertown, Md., directors. The capital stock is $1,000.

EBENSBURG, PA.—A new telephone line is being erected from this place to Patton and other towns in northern Cambria.

Business Troubles.

BOSTON, MASS.—The Woburn electric light plant has passed out of the hands of receivers to new organization, of which the following are the officers: President, W. B. Littlefield; treasurer, L. J. Moulton.

CHICAGO, ILL.—William H. Cook has been appointed receiver for the Suburban Electric Light and Power Company, which owns a plant at Park Ridge.

OGDEN, UTAH—W. H. Rowe has been appointed receiver for the City Street Railway Company of this city.

SANDUSKY, OHIO—The Painesville, Fairport & Richmond Street Railroad was sold at sheriff's sale for $3,160.

CHICAGO, ILL.—The appointment of a receiver for the Nutting Electric Manufacturing Company has been asked for.

New Manufacturing Companies.

TACOMA, WASH.—Central Electric Manufacturing Company has been incorporated by E. E. Salisbury, A. E. Dean, W. K. Wright, F. B. Taylor, H. E. Wright. Capital stock, $50,000.

PORTLAND, ME.—Carbon Electric Generator Company has been incorporated by W. H. Forbes, president, Milton, Mass.; W. H. Forbes, treasurer, Milton, Mass. Capital stock, $5,000,000.

MANISTEE, MICH.—Electrical Manufacturing Supply Company has been incorporated, with a capital stock of $50,000.

RUTHERFORD, N. J.—National Ball Nozzle Company has been incorporated by John T. Collins, Rutherford, N. J., Montreville Strickland, Washington, D. C., Jos. W. Oakman, Brooklyn, N. Y., to manufacture and deal in steam, gas and electrical appliances. Capital stock, $100,000.

Increase of Capital.

PHILADELPHIA, PA.—The Bell Telephone Company has increased the capital stock from $1,000,000 to $2,000,000. The increase is stated to be for the extension of the business.

ABINGTON, MASS.—The Hanover Street Railway Company has increased its capital stock from $20,000 to $30,000.

KINDRED INTERESTS

The Correspondence School of Technology, Cleveland, Ohio, have prepared a schedule showing in detail their electrical workers' course.

The Cutter Electrical and Manufacturing Company, 1112 Sansom street, Philadelphia, have issued an artistic and comprehensive catalogue of their well known I-T-E automatic magnetic circuit breakers.

Stanley & Patterson, 32 and 34 Frankfort street, New York city, have been appointed sole selling agents in the United States for Fleming's woven-wire dynamo brushes. They will keep a large and assorted stock on hand and will be able to ship orders promptly.

The Ward Leonard Electric Company, Thirteenth and Washington streets, Hoboken, N. J., will hereafter supply the rheostats heretofore made by the Carpenter Enamel Rheostat Company. The new concern has just issued a comprehensive rheostat catalogue.

The Pettingell-Andrews Company, of Boston, have issued a handy souvenir in the form of a flexible leather case, containing the rules and requirements of the National Board of Fire Underwriters. The company's many customers will doubtless appreciate this souvenir.

The Ball Electric Light Company, 404 West Twenty-seventh street, New York city, has issued a new catalogue describing the improved Ball system of electric arc lighting. Some new interests are coming into this company, and it is said that they will make an aggressive bid for business in the near future.

"An Era in Boiler Performance" is the title of a very interesting and valuable pamphlet issued by the Stirling Company, of Chicago. It gives the results of an evaporative test made on three Stirling boilers at the Waltham, Mass., Bleachery and Dye Works by D. P. Jones, M. E., and Dean & Main, engineers.

The Sioux City Electrical Supply Company, Sioux City, Iowa, have been obliged to increase their factory to keep up their orders for telephone goods. Among the many orders now on their books is one for 1,000 dials and automatic central switches for the Automatic Telephone Switch Company; 800-drop manual board for the Home Telephone Company, of Sioux City; 100-drop manual board and 70 telephones for Sheldon, and 75 telephones for Sibley.

The Western Telephone Construction Company, of Chicago, report a large increase in their orders. Recent contracts are: Du Quoin, Ill., 100 telephones; Ashland, Ky., 150 telephones; Bellaire, Ohio, 75 telephones; Metropolis, Ill., 60 telephones; Oberlin, Ohio, 150 telephones; Wauseon, Ohio, 100 telephones; Barnesville, Ohio, 200 exchange equipment; Rochester, N. Y., 50 telephone equipment; Ticonderoga, N. Y., 150 exchange equipment.

The West Shore Railroad, through General Passenger Agent C. E. Lambert, has sent to the ELECTRICAL REVIEW an advance copy of its Summer book, "Homes and Tours," for the season of 1896. The cover is a reproduction of one of Mr. Charles Graham's famous water colors. On the front is a view of the lighthouse at West Point, N. Y., with "Crows' Nest" in the distance, and a reproduction of the past and present methods of travel; also a view of one of the road's modern stations—West Park, N. Y.

The Bernstein Electric Company is moving its manufacturing plant to the large brick building, No. 355 Congress street, Boston, the business office having already been moved from 620 Atlantic avenue to the same building. By these changes the company not only greatly increases and improves its manufacturing facilities, but combines the manufacturing and commercial departments. Mr. James Bradley, who has been for several years identified with the company as superintendent and electrician, is now associated with Mr. H. B. Cram in the active management of the business. The Bernstein lamp, which has been on the market since 1882, has long been noted for its excellent qualities, and now with improved facilities the company anticipates a rapid increase in its already large business.

ESTABLISHED 1867
PARTRICK & CARTER CO.
ELECTRICAL SUPPLIES
125 South 2d St. Philadelphia
CATALOGUES ON APPLICATION
Send Business Card and Mention ELECTRICAL REVIEW.

BELLS, PUSH BUTTONS, DESK CLAMPS, Etc., Etc.
Send for catalogue; free if ELECTRICAL REVIEW is mentioned.
HUEBEL & MANGER, Mfrs,
286-90 GRAHAM ST.,
Brooklyn, N. Y.

WHITNEY ELECTRICAL INSTRUMENT CO., MANUFACTURERS OF
High-Grade Electrical Instruments of Every Description.
PENACOOK, N. H., U. S. A.

ROSE POLYTECHNIC INSTITUTE,
Terre Haute, Ind. A School of Engineering. Mechanical, Electrical, Civil Engineering, Chemical courses. Well endowed. Extensive Shops and Foundry. Modernly equipped Laboratories in all departments. Expenses low. Address C. L. MEES, President

REDUCED RATES TO ST. LOUIS.

The Republican National Convention will meet in St. Louis, June 16. For this occasion the B. & O. R. R. Co. will sell Excursion Tickets from all stations on its line East of the Ohio River for all trains June 12 to 15, inclusive, valid for return passage until June 21, at one fare for the round trip.

The Baltimore & Ohio is a direct line to St. Louis, running two solid vestibuled fast express trains with through Pullman Sleeping Cars attached every day in the year.

For rates and other information, apply to nearest B. & O. Ticket Agent.

ELECTRICAL AND OTHER ENGINEERING BRANCHES
TAUGHT BY MAIL.
The Correspondence School of Technology,
CLEVELAND, OHIO.

THE BRADY MAST-ARMS.
T. H. BRADY, New Britain, Conn., U. S. A.
Manufacturer of Mast-Arms, Pole and Swinging Hoods, House Brackets and other Specialties for Construction Work.—*Catalogues and Prices furnished on application.*

INDIA and AMBER MICA,
UNCUT AND CUT TO SIZE.
STAMPED SOLID SHEET SEGMENTS and WASHERS.
Mica in any form wanted.
Write for samples and quotations.
A. O. SCHOONMAKER,
158 William Street, New York.

BI-METALLIC WIRE.
COPPER and STEEL.
(JOHN A. ROEBLING'S SONS CO., MAKERS.)
Bi-Metallic Electric Transmission Company,
1204 HAVEMEYER BUILDING
26 Cortlandt Street, New York.
Send for Descriptive Pamphlet.

WHITE-CROSBY COMPANY,
CONTRACTING ENGINEERS,
EQUITABLE BUILDING, BALTIMORE, MD.
New York Office, 29 Broadway.

FOR TELEPHONES
GO TO THE VIADUCT CO.,
BALTIMORE.

STEAM ENGINEERING
(Stationary, Locomotive or Marine); Mechanics; Mechanical Drawing; Electricity; Architecture; Architectural Drawing and Designing; Civil, Railroad, Bridge, Municipal and Hydraulic Engineering; Plumbing; Mining; Prospecting; English Branches.
The Steam Engineering course is intended to qualify engineers to secure Licenses.
Send for Free circular and Book of Testimonials, stating the subject you wish to study, to
The International Correspondence Schools, B 1003, Scranton, Pa.
TAUGHT BY MAIL
THOROUGH PRACTICAL

I-T-E
Automatic Magnetic Circuit Breakers
C-S Flush Switches.
The Cutter Electrical & Mfg. Co.,
1112 Sansom St., Philadelphia.

ELECTRIC CONDENSERS.
WM. MARSHALL,
Manufacturer.
STANDARDS A SPECIALTY.
709 LEXINGTON AVENUE, NEW YORK.

McINTIRE'S PATENT
CONNECTORS AND TERMINALS.
Special Connectors for HARD-DRAWN COPPER WIRE, *All Sizes.*
Fused Wire, Fused Links and Strips.
The C. McINTIRE CO., 13 & 15 Franklin Street,
NEWARK, N. J.

No. 7707

IRON BOX BELL
Ask your dealer for the No. 7707 Iron Box Bell.
H. E. & C. BAXTER,
Manufacturers of
Electrical Supplies,
Bedford, Division and Canton Sts.,
BROOKLYN, N. Y.

SOLAR CARBON & MANUFACTURING CO.,
MANUFACTURERS OF
Electric Light Carbons—Soft-Cored and Solid Carbon Brushes. Battery Carbons and Carbon Specialties.
ADDRESS 95 FIFTH AVENUE, PITTSBURGH, PA.

WEATHER-PROOF TRADE MARK "O.K." LINE AND HOUSE WIRES

AGENCIES:
ELECTRIC APPLIANCE CO., CHICAGO, ILL.
PETTINGELL-ANDREWS CO., BOSTON, MASS.
ELECTRICAL ENGINEERING CO. MINNEAPOLIS, MINN.
ST. LOUIS ELECT'L SUPPLY CO., ST. LOUIS, MO.
BRADFORD BELTING CO., CINCINNATI, O.

PHILLIPS INSULATED WIRE CO.,
NEW YORK OFFICE: 39 & 41 Cortlandt Street.
FACTORY: PAWTUCKET, R. I.

ELECTRICAL PATENTS

ISSUED MAY 26, 1896.

561,046 Electro-therapeutic apparatus for treating deafness; S. J. Collier, Chicago, Ill.

561,073 Lightning arrester; W. Cooper, Schenectady, N. Y.

REISSUE.

11,542 11,543 Electric locomotive; J C. Henry, Denver, Colo.

11,544 Combined gas and electric light fixture; L. Stieringer, New York, N. Y.

11,545 Automatic device for removing resistance in starting electric motors; G. H. Whittingham, Baltimore, Md.

ISSUED JUNE 2, 1896.

561,107 Door lock switch for electric lights; W. E. Goucher, Jamestown, N. Y.

561,116 Electric switch; Frank Land, Syracuse, N. Y.

561,144 Alternating electric motor; J. A. G. Trudeau, Ottawa, Canada—Consists of a rotatable armature, stationary energizing coils therefor, stationary field magnets located within the armature and energizing coils encircling said field magnets, the armature coils and field coils being both connected with a source of electric supply, but in shunt relation to each other.

561,159 Fusible cut out; L. W. Downes, Providence, R. I.—A fuse wire combined with a tubular sheath of insulating and incombustible material inclosing said fuse wire and confining a body of air, said sheath having contracted expansible ends.

561,168 Trolley stand; F. N. Lelsey, New Haven, Ct.—A trolley pole socket piece secured to the table on the car top, a spring retracted sheave carried upon said table, and a flexible connection passing about said sheave or pulley and connected at one end to said socket piece and at its opposite end to a rigid support.

561,183 Electric meter; A. G. Waterhouse, Hartford, Ct.—A meter which is actuated or controlled by an electric current, and means for registering the movements of said meter, in combination with time mechanism, to which motion is imparted to said time mechanism and register.

561,184 Hanger for electric lights; W. S. Weston, Etherly, Ill.

561,185 Electric lamp hanger; W. S. Weston, Chicago, Ill.

561,205 Pole piece for electrical batteries; F. G. Curtis, Philadelphia, Pa.—Consists of a carbon plate having electrically deposited thereon an alloy of copper and tin in the proportion specified.

561,224, 561,225 Electric car; J. C. Henry, Westfield, N. J.—Two driving axles having suitable cranks, a motor mounted on and between said axles by a non-yielding support, a crank operated by the motor shaft and rigid connecting bar hung by rigid or non-yielding support on the three cranks.

561,271 Motor controlling device; C. E. Ongley, New York, N. Y.—An electrically controlled motor and a series of commutators in the electrical connection to make and break the circuit at predetermined intervals operated by the motor, and means to control the circuit to any one of said commutators.

561,272 Electrically controlled steering device; C. E. Ongley, New York, N. Y.

561,284 Electric switch; Hiram Ross, Providence, R. I.

561,294 Electric heater; H. A. Thomas, Niagara Falls, N. Y.

561,307 Electric railway; H. Brahdenburg, Chicago, Ill.—An electric railway having a conductor with the external insulating covering and a longitudinal uninsulated oil channel on the upper surface for the trolley contact.

561,335 Telephone exchange system; K. B. Miller, Wilkinsburg, Pa.

561,354 Power gearing for electric cars; E. A. Sperry, Cleveland, Ohio.

561,358 Microphone; G. W. Sutton, New Rochelle, N. Y.

561,377 Automatic telephone call; G. Q. Dean, New York, N. Y.—A movable contact maker and contacts actuated by said maker combined with a movable core, a vitalizer for the core and a detent actuated by and made to engage said core.

561,390 Dynamo electric machine; A. I. Gravier, Paris, France.—Consists of an armature, the core of which is provided with independent coil sections arranged in diametrically opposite pairs, and field magnets having recessed pole pieces with inwardly tapering side pieces provided with radially tapering faces.

561,416 Attachment for telephones; J. H. Miller, Washington, D. C.—Consists of a movable shield having a hinged strap adapted for attaching the shield to the telephone box by inserting the strap between the door and the edge of the box.

561,417 Telephone system. 561,418 Telephone exchange system. 561,420 Line jack for telephonic switchboards. 561,421 Telephone call box. 561,422 Telephone call signal for central stations. 561,423 Telephone; Paul Minnis, Mobile, Ala.—A telephone apparatus consisting of a single handle formed in two parts, brackets having collars screwed upon the ends of the said parts, when united, and a receiver and transmitter each mounted on one of said brackets.

561,424 Telephone switch plug; Paul Minnis, Mobile, Ala.

561,443 Electric lamp hanger; J. Schmidt, New York, N. Y.—Comprises a rotary spindle, means for rotating the same, a block for supporting the spindle and its rotating means, a cover for attachment to the block and having a slot in its lower side, and a tubular carrier movable in said slot

561,448 Magnetic medical apparatus; A. B. Slater, Omaha, Neb.—Comprises a support for a body and electro-magnets distributed beneath the surface of the support so as to create a magnetic field therein.

561,498 Party line telephone apparatus; W. W. Dean, St. Louis, Mo.

561,530 Electric car truck; J. Taylor, Troy, N. Y.—Has a bracket casting composed of upper and lower flanges, lateral wings and a central bolt opening.

561,547 Automatic telegraph; S. P. Frier, Hasbrouck, N. Y.

"Eclipse" Electric Bicycle Lamp.

The illustration herewith shows the "Eclipse" electric lamp for bicycles, carriages, miners, watchmen, firemen, and for any purpose where a portable light is required. It is manufactured by the Electric Lamp Company, of Buffalo, N. Y.

In order to make a portable electric lamp which would be acceptable and satisfactory to the public, it should be small, compact, and light in weight; it should be simple in construction, easily operated and not

"Eclipse" Electric Bicycle Lamp.

liable to get out of order; should furnish a good, strong light and burn under any and all conditions; its first cost should be no more than a good oil lamp and it should be as cheaply maintained. The makers claim that the "Eclipse" lamp fulfills all these conditions.

It is said that this lamp throws a strong light for from 75 to 100 feet. The materials for recharging the primary battery, furnishing current to the lamp, are put up in convenient form and are very cheap in price.

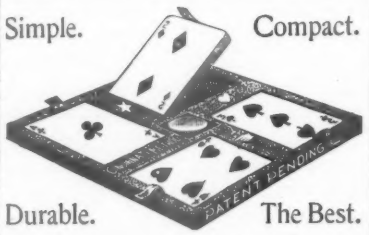
AMERICAN ARC DYNAMOS, LAMPS AND APPLIANCES.
Our new method armatures increase efficiency 20 per cent.
BAECHTOLD & PARKER ELECTRIC CO.
79-81 Washington Street,
BROOKLYN, N. Y.

RECEIVER'S SALE.
The complete plant of the Delevan Electric Light and Power Company, Delevan, N. Y., a place of 1,000 population, located in the northeast corner of Cattaraugus County, will be sold on Tuesday, the 14th day of July, 1896, one o'clock P. M., at that place, to the highest bidder. Here is an opportunity for some engineer with a small amount of money to own and operate his own plant. He would require no help. The plant is operating successfully and earning a good income, but on account of the management does not pay dividends. For particulars, address Lyman J. Cheney, Receiver Delevan, N Y. Time will be given on part of the purchase price.

DYER & DRISCOLL,
Patent Solicitors, 36 Wall Street, N. Y.
have done all my patent soliciting work, both for this and foreign countries, continously for the past fourteen years.
Thomas A Edison

WASHINGTON PATENT AGENCY. LARGEST IN THE WORLD.
908-914 C Street, N. W.,
WASHINGTON, D. C.
Free opinion of merit. ELECTRICAL EXPERTS.

PATENTS.
TRADE MARKS.—DESIGNS.—COPYRIGHTS.
CAN YOU OBTAIN A PATENT?
Send me a model or drawing of your invention, and a description, and I will examine same and advise you promptly. My fees are moderate in all Patent matters, and I can obtain a Patent in the shortest possible time.
All Patents taken out through me are given special notice in the leading journals of the country, thus bringing same widely before the public without cost to inventor.
REFERENCES: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.
EDW. S. DUVALL, JR., Solicitor of Patents. Loan and Trust Bldg., WASHINGTON, D. C.

Simple. Compact.


Durable. The Best.
Do you play Duplicate Whist?
If you do, you will readily appreciate this *improved* method. If you do not, you will wish to adopt the *best* method, when you do play. In either case, send for circular and price list, or ask your dealer. Full sets, 8 to 48 trays.
Sample tray and card sent postpaid for 40 cts.
12 trays in handsome box, counters, rules etc....$4.50
Same with 12 packs "U. S." Bicycle cards.....$6.50
Prepaid by express to any part of the U. S.
M'f'd and Sold by WALTER S. COLES, Neave B'l'd'g Cincinnati, O.

Cripple Creek
The Santa Fe Route is the most direct and only through broad-gauge line from Chicago and Kansas City to the celebrated Cripple Creek gold mining district. Luxurious Pullmans, free chair cars, fastest time, and low rates.
Gold! Gold!!
Address G. T. Nicholson, G. P. A., A., T. & S. F. Ry., Monadnock Blk., Chicago, and ask for free copy of profusely illustrated book descriptive of Cripple Creek. It is well worth reading.
Santa Fé Route

REMOVAL
OF THE
Electrical Review
TO THE
Times Building,
39 & 41 PARK ROW,
NEW YORK.
On May 1st the offices of this journal were removed to the well known and modern *Times* Building, at the junction of Park Row and Nassau street, a few numbers above our former address.
This change, after nearly a decade in its present location, the ELECTRICAL REVIEW is compelled to make to allow for a new building to be erected.
All communications to this journal should be addressed, after this date, to the
Electrical Review,
TIMES BUILDING,
P. O. Box 2339, NEW YORK.

TELEPHONE
AND
TELEGRAPH INSTRUMENTS

We invite you all to write us for our Rock Bottom Prices on our Pulverized Carbon Transmitter Battery Telephones; also Telegraph Instruments, Burglar Alarms, Batteries, Wire, Motors, etc.

We have just opened a new store with Electrical Supplies of every description. Send for Catalogue.

Citizens' Telephone Company,
BALDWINSVILLE, MASS.

NOVELTY ELECTRIC CO.,
PHILADELPHIA, PA.

Agents for
- Okonite Insulated Wires.
- Medbury Overhead Railway Material.
- Changeable Electric Headlights.
- Globe Metal Works' Trolley Wheels.
- P & B Electrical Compounds.
- Perkins Incandescent Lamps.
- Schiff, Jordan & Co.'s Ship Cored Carbons.

ELECTRICAL SUPPLIES OF EVERY KIND.

THE BOOK OF BOOKS FOR
WIREMEN, ELECTRICAL ENGINEERS, CONTRACTORS, CONSTRUCTING ENGINEERS, ARCHITECTS AND STUDENTS.

HOW TO WIRE BUILDINGS

A MANUAL OF THE ART OF INTERIOR WIRING.

BY AUGUSTUS NOLL, E. E.

ILLUSTRATED, - 162 PAGES, - PRICE, $1.50.

This is one of the most important practical books on electrical work that has ever been issued. It is written by a past master in the art of interior wiring; by one who has probably wired up more buildings and lamps than anybody else in the world. MR. NOLL began the practice of his profession at the very commencement of electric lighting by incandescent lamps, and he has been an active leader in all the later developments of recent years. The book abounds in solid, definite, practical instructions, rules, suggestions and advice, and is liberally illustrated with drawings, diagrams, tables, etc.

CONTENTS:

Chap. 1.—Introduction; Chap. 2.—General Considerations; Chap. 3.—Location of Conductors; Chap. 4.—Division of Circuits and Distribution of Current; Chap. 5.—Loss of Electrical Energy in Conductors; Chap. 6.—Plans; Chap. 7.—Conduit Wiring; Chap. 8.—Switchboards; Chap. 9.—Appliances and Connections; Chap. 10.—Converter Work; Chap. 11.—Overhead Wiring; Chap. 12.—Fuse Wire; Chap. 13.—Insulation; Chap. 14.—Electrolysis; Chap. 15.—Adverse Wiring Conditions; Chap. 16.—Theatre and Stage Lighting; Chap. 17.—Plans of Distribution; Chap. 18.—Distribution of Light; Chap. 19.—Distribution of Labor and Hints to Foremen; Chap. 20.—Preliminary to Rules, Electrical Data, etc.; Chap. 21.—Rules for Ascertaining Required Sizes of Wire; Chap. 22.—Energy-Power; Chap. 23.—Dynamos and Motors; Chap. 24.—Pulleys; Chap. 25.—Belting; Chap. 26.—Engines; Chap. 27.—Conclusion.

THE BOOK IS HANDSOMELY PRINTED ON EXTRA THICK PAPER IN LARGE, PLAIN TYPE.

Sent postage free to any address on receipt of price, by

ELECTRICAL REVIEW PUBLISHING CO.,
TIMES BUILDING, 41 PARK ROW, NEW YORK.

NOVELTY PAPER SHADES

For 16 C.-P. Incandescent Lamps.

8 Beautiful Colors

for temporary ornamental decoration, and for protecting lamps from dust, dirt and flies. They make a handsome appearance with or without light. They look like porcelain lilies. In order to introduce these shades a *set of eight will be sent to any address in the United States, by mail, on receipt of 35 cents,* P. O. stamps or postal note.

A. A. McCreary, 136 Liberty St., New York.

SCREW SLOTTING MACHINE

THE GARVIN MACHINE CO.,
MAKERS OF AND DEALERS IN
METAL-WORKING MACHINERY
OF EVERY KIND.

Universal and Plain Milling Machines, Drill Presses, Screw Machines, Hand and Engine Lathes, Planers, Turret Lathes, Shapers, Gear Cutters, Die and Cutter Grinders, Topping Machines, etc., etc.

A COMPLETE LINE OF
Special Bicycle Machinery.

Write for catalogues and list of new and second-hand machinery for immediate delivery.

SPRING & VARICK STS., NEW YORK.
51 NORTH 7TH ST., PHILADELPHIA, PA.

J. G. BRILL COMPANY,

Philadelphia,

BUILDERS OF

ELECTRIC, CABLE, SUBURBAN CARS AND TRUCKS.

INVENTORS and BUILDERS OF BRILL No. 21 B and EUREKA MAXIMUM TRACTION TRUCKS FOR ELECTRIC CARS.

Received the Only Medals of Award for Rubber-Covered

INSULATED WIRES

AERIAL, UNDERGROUND, SUBMARINE AND INTERIOR USE.

KERITE TAPE.

Catalogues, Samples and Prices on Application.

S. F. B. MORSE, CHICAGO, ILL.
CALIFORNIA ELECTRIC WORKS, SAN FRANCISCO, CAL.
KENNEDY & DU PEROW, WASHINGTON, D. C.

Wires and Cables at the WORLD'S FAIR at Chicago.

AND CABLES;

TELEPHONE, TELEGRAPH, POWER AND LIGHTING.

W. R. BRIXEY, Manufacturer,

J. E. HAM, General Agent,

203 Broadway, NEW YORK.

SPECIAL ATTENTION GIVEN LEAD-ENCASING WIRES AND CABLES.

WESTON Electrical Instrument Co.,

114-120 William St., NEWARK, N. J., U. S. A.

Illuminated Dial Station Instruments.

These instruments are based upon the same general principle, and are just as accurate as our regular Standard Portable Direct-Current Voltmeters and Ammeters, but are much larger, and the working parts are inclosed in a neatly designed, dust-proof, cast-iron case which effectively shields the instruments from disturbing influences of external magnetic fields.

Weston Standard Illuminated Dial Station Voltmeter, Style B.

Weston Standard

Portable Direct-Reading Voltmeters and Millivoltmeters, Ammeters and Milliammeters, Wattmeters and Voltmeters for Alternating and Direct-Current Circuits.

Our portable instruments are recognized as standards throughout the civilized world.

Our Semi-Portable Laboratory Standard Voltmeters and Ammeters are still better.

They are the most reliable, absolute standards for Laboratory use.

Mention the ELECTRICAL REVIEW when writing for catalogues.

FARADAY CARBON CO.,

ELECTRIC LIGHT CARBONS,

JEANNETTE, PA.

ALFRED F. MOORE,

MANUFACTURER OF

INSULATED ELECTRIC WIRE

FLEXIBLE CORDS AND CABLES,

200 and 202 North Third Street, PHILADELPHIA, PA.

BAKER & CO.,

IMPORTERS, MELTERS AND REFINERS OF

PLATINUM,

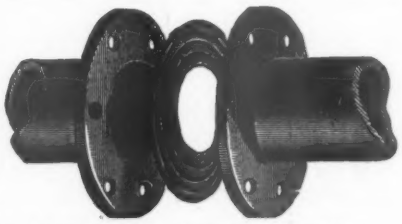
408, 410, 412 and 414 N. J. R. R. Ave., NEWARK, N. J.

Platinum in sheet and wire, all sizes, and any degree of hardness. Scrap and native Platinum purchased

NEW YORK OFFICE: 121 LIBERTY STREET.

Joints made absolutely tight and durable by PATENT CORRUGATED

COPPER GASKETS.



Furnished in all shapes and sizes for flanged PIPES, CYLINDERS, CHESTS, Etc. Price-List and Sample free.

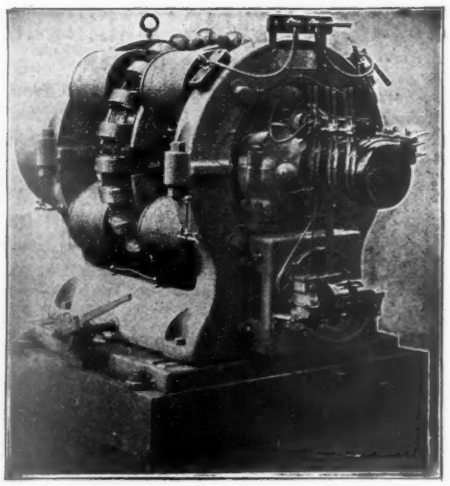
U. S. MINERAL WOOL CO.,

2 Cortlandt Street, NEW YORK.

Bourne & Knowles Mfg. Co., Cleveland, O., Western Agents.

THE

ELECTRIC LIGHTING and POWER APPARATUS.



BRUSH

Three circuits run from an 80-light Brush dynamo; maximum potential between two points on the circuits or dynamo not exceeding 1,500 Volts. This will be exhibited at the Brush exhibit at the National Exhibition in New York. Go and see it!

ELECTRIC CO.,

CLEVELAND, O.